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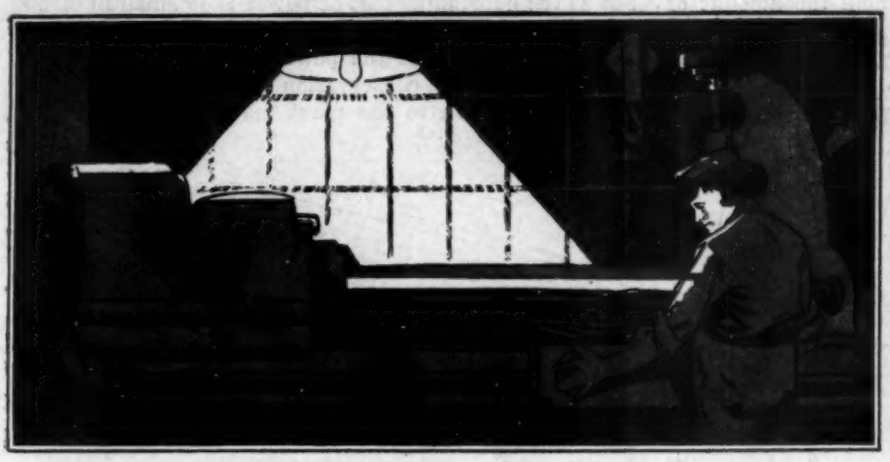


LIGHT, ELECTRICITY and The Shop

By C. E. Clewell

From Coal Pile To Machine Tools And Lamps

The urgent necessity for the conservation of coal is made the basis for the following notes on some of the channels through which every shop has the opportunity to contribute to the saving of fuel. The article points out the ways in which losses occur between the coal pile of the shop power house and the lamps or motors which are operated by the power supply. Emphasis is placed on the need for reducing the demands on the power house, and the relation of the methods of using power to the total power consumed.

EVERY shopman should desire to coöperate in the saving of every pound of coal in the operation of our industrial plants. The fact that each individual has only a small opportunity to carry out this plan of conservation is no excuse for him to neglect the opportunity, since the sum total of all these individual effort during the next 12 months will go far toward reducing the consumption of fuel and preventing a serious fuel shortage.

For purposes of study, the losses of power between the coal pile in the shop power house and the machine tools are listed in Table I, and those up to the lamps in the shop-lighting system are given in Table II. The reader can select from these two tables the items over which he has control, actual improvements in them usually being up to the shop department which has control of the given division of the shop power supply. It should be noted that these tables contain items which relate to the use of the motor-driven machine tool or to the use of the lamps, and as these uses of the various appliances have a much wider bearing on the individual shopman than some of the others they will be given special attention in these notes.

Every possible saving in coal is advisable provided it does not involve losses in other ways which are more serious to the country. This places upon every individual the responsibility of intelligently deciding on the cost of the proposed saving. Thus, to illustrate, in one large city it was found that an effort to save coal by giving up the use of street lamps encouraged thieves and other wrongdoers to such an extent that the street lamps were ordered lighted again to prevent crime. In this case the saving of coal by turning off the street lamps resulted in a greater loss to the public by impairing its safety. In the operation of shop machine tools and machinery in general there are efficient as well as inefficient ways of applying power. For example, cases have been reported where the power losses in the line shafting and belting leading from the main power supply to the machine make up a large proportion of the total power supplied to the machine. This usually means a poorly designed power-transmitting system or possibly it means a run-down condition of the line shafts and belts.

To remedy this the substitution of an electric supply with a motor attached to each machine tool or with a larger motor arranged to drive a small group of machines is sometimes resorted to. If the electric-supply circuits are planned carefully the losses between the power house and the machinery may be kept down to a relatively small item, and the difference is just that much reduction in the amount of fuel necessary to supply power to the shop machinery, a condition that should be sought after.

Savings of fuel brought about by improved power transmission are usually in the hands of some shop-equipment department, hence do not fall under the kind of economy which the individual shopman can control. However, this leads to another view of the machine-tool problem.

Table III shows the principal items which constitute the charges against a machine tool per hour. Of these, power is usually on the order of 2 or 3 per cent. and labor and fixed charges perhaps 50 per cent., so that the value of the power is seen to be very small relatively speaking. At the same time while the cost of power for operating a machine tool is usually small compared with the other charges, it is the aggregate amount

of power used by the entire shop and the total of all the needs of individual shops which help to make up the demand for coal by the nation. Hence we should take the attitude that no matter how small the amount of

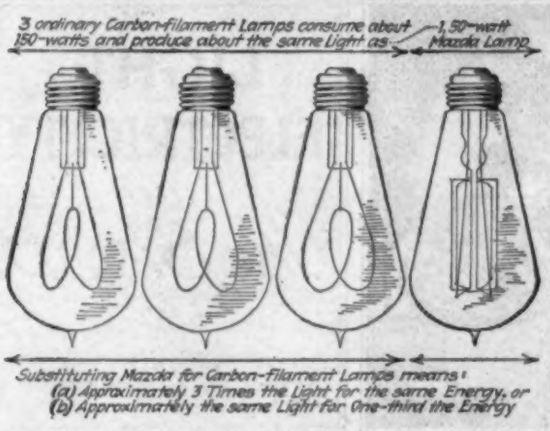

3 ordinary Carbon-filament Lamps consume about 150-watts and produce about the same Light as
1 50-watt Mazda Lamp
Substituting Mazda for Carbon-Filament Lamps means:
(a) Approximately 3 Times the Light for the same Energy, or
(b) Approximately the same Light for One-third the Energy

FIG. 1. GRAPHICAL COMPARISON OF THE EFFICIENCY OF OLD AND MODERN LAMPS FOR SHOP USE

coal required by an individual machine tool may be, it is in itself important and deserves careful attention.

Turning again to Table III it is seen that the labor charge per hour is a relatively large item in the hourly

TABLE I. SHOWING LOSSES BETWEEN COAL PILE AND MACHINE TOOLS

LOSSES IN POWER HOUSE

1. Heat losses up the chimney.
2. Thermal losses between boiler and engine.
3. Frictional losses in engine.
4. Belt losses between engine and electric generator.
5. Electrical and mechanical losses in generator.

LOSSES THROUGHOUT THE SHOP

6. Electrical losses in the distribution circuits between the power house and the machinery driven.
7. Transformer losses where same are used in alternating-current circuits.
8. Mechanical line and countershaft losses.
9. Belt losses between shafting and machines.
10. Electrical and mechanical losses in the motors.
11. Mechanical losses in the machine tools.

LOSSES IN THE USE OF MACHINERY

12. Due to wrong kind or size of motor.
13. Due to improper controllers for the motors.
14. Due to poor cutting tools.
15. Due to operation at unduly low-cutting or driving speeds.
16. Due to inefficient acceleration and braking of the machine tools.

cost of machine-tool operation. Let us suppose that by a little coöperation by the machine-tool operator, or by some slight change in the manipulation of the work

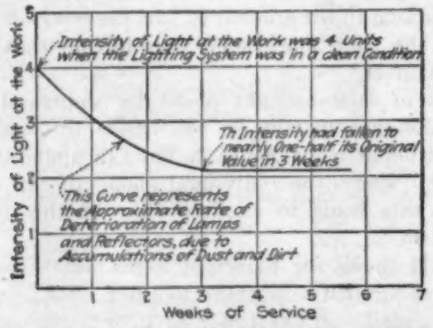

Intensity of Light at the Work was 4 Units when the Lighting System was in a clean Condition
The Intensity had fallen to nearly One-half its Original Value in 3 Weeks
This Curve represents the Approximate Rate of Deterioration of Lamps and Reflectors, due to Accumulations of Dust and Dirt
Intensity of Light at the Work
Weeks of Service

FIG. 2. CURVE SHOWING DETERIORATION WHICH MAY OCCUR IN LIGHTING EQUIPMENT, DUE TO DUST AND DIRT ACCUMULATIONS IN THE SHOP

throughout an operation, it is possible to increase the quantity of work per machine-hour or even to reduce the amount of defective workmanship so as to raise the gross output. Such an increase, if only due to an effort to maintain perfectly fair standards of output, may mean a slightly increased use of power per hour, but as the percentage cost of power is so small in terms of the total hourly cost, the increased output means a more effective use of the power, which may be interpreted as an actual conservation of fuel.

The suggestion to the plant manager, therefore, is

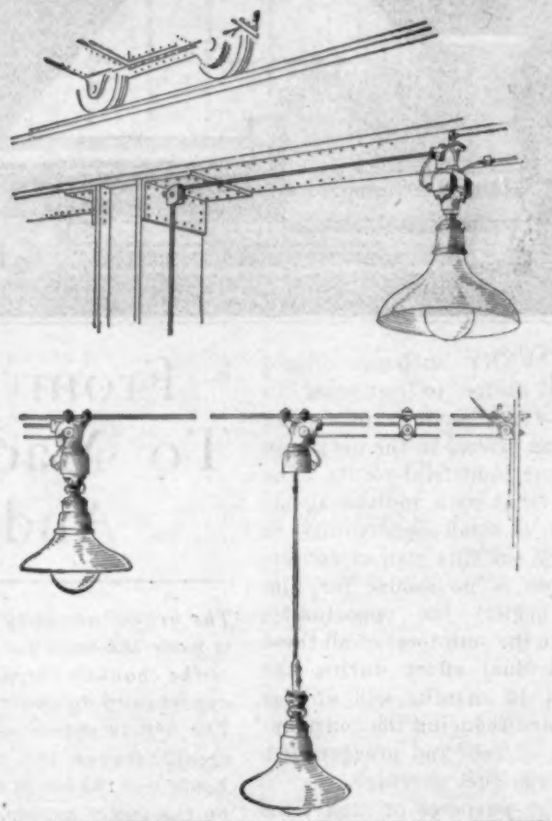


FIG. 3. ARRANGEMENT AND OPERATION OF A THOMSON DISCONNECTING HANGER ADAPTED FOR SHOP USE

that fuel conservation in the operation of machine tools or other shop machinery resolves itself into finding out where fuel losses occur through inefficient utilization in the power house and in power-transmission systems, and also in the proper planning of operations so that the machinery in general may be efficiently utilized.

The question of saving power applied to machinery

TABLE II. SHOWING LOSSES BETWEEN COAL PILE AND LAMPS

LOSSES IN POWER HOUSE

1. Thermal, mechanical and electrical losses in the generation of power as listed in Table I.

LOSSES THROUGHOUT THE SHOP

2. Mechanical and electrical losses in line shafting, countershafting, belting, electric circuits, transformers, motors and machine tools as outlined in Table I.

LOSSES IN THE USE OF LAMPS

3. Due to inefficient lamps.
4. Due to a lack of reflectors in conjunction with the lamps.
5. Due to neglect of cleaning lamps and reflectors.
6. Due to inflexible methods of controlling the lamps; that is, in having too many lamps on a single switch.
7. Due to improper arrangements of lamps with respect to the work.

is so intimately tied up with production that the suggestions in the foregoing paragraphs can well be looked upon as questionable in their relation to any saving of industrial fuel in the handling of the machine tool itself. In other words, present industrial conditions

make it necessary to promote the most efficient production, such as is seen in the munition and shipbuilding industries where speed is most important. Hence coal saving in the operation of machine tools must be obtained by a more efficient utilization of fuel in the power

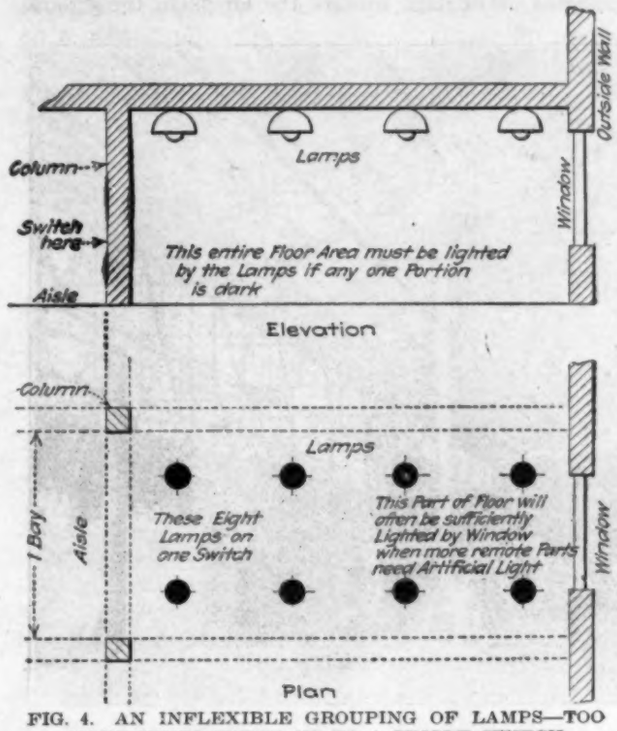


FIG. 4. AN INFLEXIBLE GROUPING OF LAMPS—TOO MANY UNITS WIRED UP TO A SINGLE SWITCH

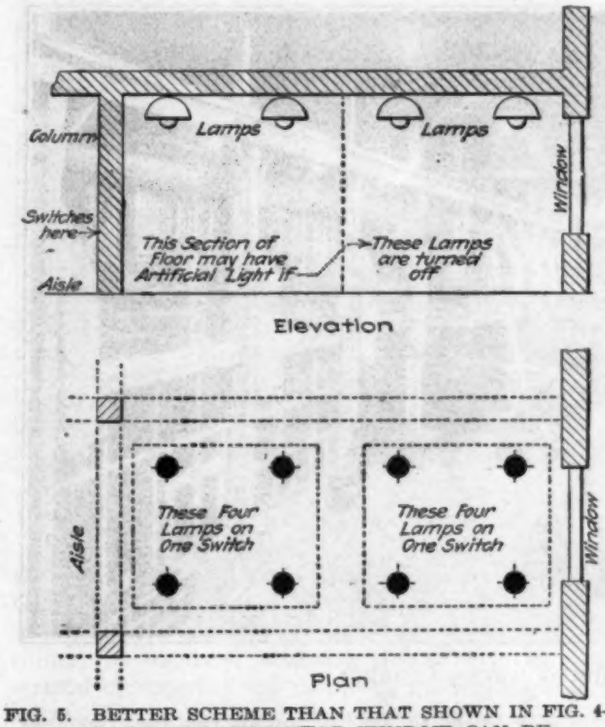


FIG. 5. BETTER SCHEME THAN THAT SHOWN IN FIG. 4—GROUP OF LAMPS NEAR WINDOW CAN BE TURNED OFF SEPARATELY

house by eliminating undue losses in transmitting the power through the factory and by selecting the proper motor for use with a given machine tool. To attempt to save fuel by curtailing the actual power available for driving a machine and thus hindering the rate of production would reduce the output, which today is the one thing every shop is most anxious to maintain.

In shop lighting several ideas project themselves as channels for economy. As a general proposition the quantity of light should not be reduced; but whatever is necessary should be secured with the smallest possible consumption of coal by the use of the most efficient lamps. In Fig. 1 the energy consumption of an ordinary carbon-filament lamp is shown to be

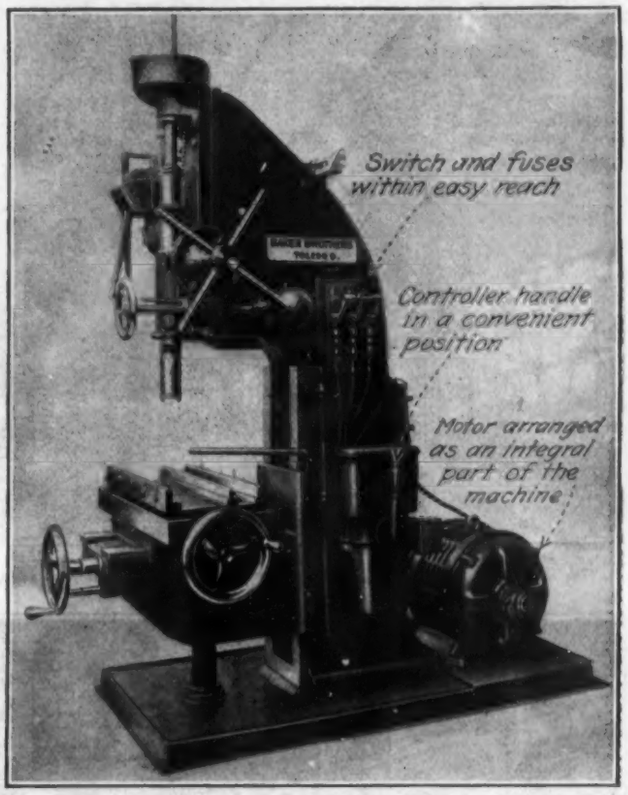

Switch and fuses within easy reach
Controller handle in a convenient position
Motor arranged as an integral part of the machine

FIG. 6. A GOOD EXAMPLE OF SCIENTIFIC MOTOR APPLICATION

about the same as that of one 50-watt mazda or tungsten lamp, whereas the amount of light produced by three such carbon lamps is practically the same as that of the one 50-watt tungsten lamp. Hence, the use of carbon-filament instead of tungsten lamps means higher coal consumption.

Next the use of reflectors which will send the light

TABLE III. SHOWING ITEMS WHICH MAY OCCUR IN THE MACHINE-HOUR RATE

GENERAL CHARGES AGAINST EACH MACHINE TOOL

1. Variable charges.
2. Salaries.
3. Interest and depreciation.

DIRECT CHARGES AGAINST EACH MACHINE TOOL

4. Wages of operator.
5. Fixed charges.

ATTENDANT OPERATING CHARGES AGAINST EACH MACHINE TOOL

6. Power for driving the machine.
7. Artificial lighting.

Note.—The exact values of each of these items per hour depends on individual conditions. However, Items 4 and 5 may be on the order of 50 per cent. of the whole, while Item 6 is likely to be on the order of 2 or 3 per cent. of the whole.

down on the work should be encouraged, as with an efficient reflector a lamp half the size may be used. Keeping lamps and reflectors clean is also a means

of saving light. Tests reported in these columns show that losses as high as 50 per cent. may occur in a short time under dusty and smoky shop surroundings, somewhat as in Fig. 2. Deterioration in this respect of the lighting system of a plant ought never to be permitted. To facilitate cleaning, however, it is necessary to take some account of the ease with which the lamps may be got at either by ladders or by other supports, or some form of disconnecting hanger, as in Fig. 3, may be considered.

Finally the psychological result on a shop where lights that are not needed are turned out is good and encourages economy in other ways. But to make this economy practical two things should be done; the first is to provide suitable switching arrangements, and the second is to train the men to use the control switches with system.

When there are no switches near the entrance of basements or at dark corners the lamps in these dark spaces are likely to remain on all the time whether required or not. Another example of wasting light is to have too many lamps on a single switch, as in Fig. 4. In this case, when the work near the windows is well lighted in the mornings and afternoons, the interior spaces may be too dark for good vision, but all eight lamps must be on if those in the dark space are needed.

FIG. 7. A MODERN FOUNDRY WITH AMPLE WINDOW AREAS

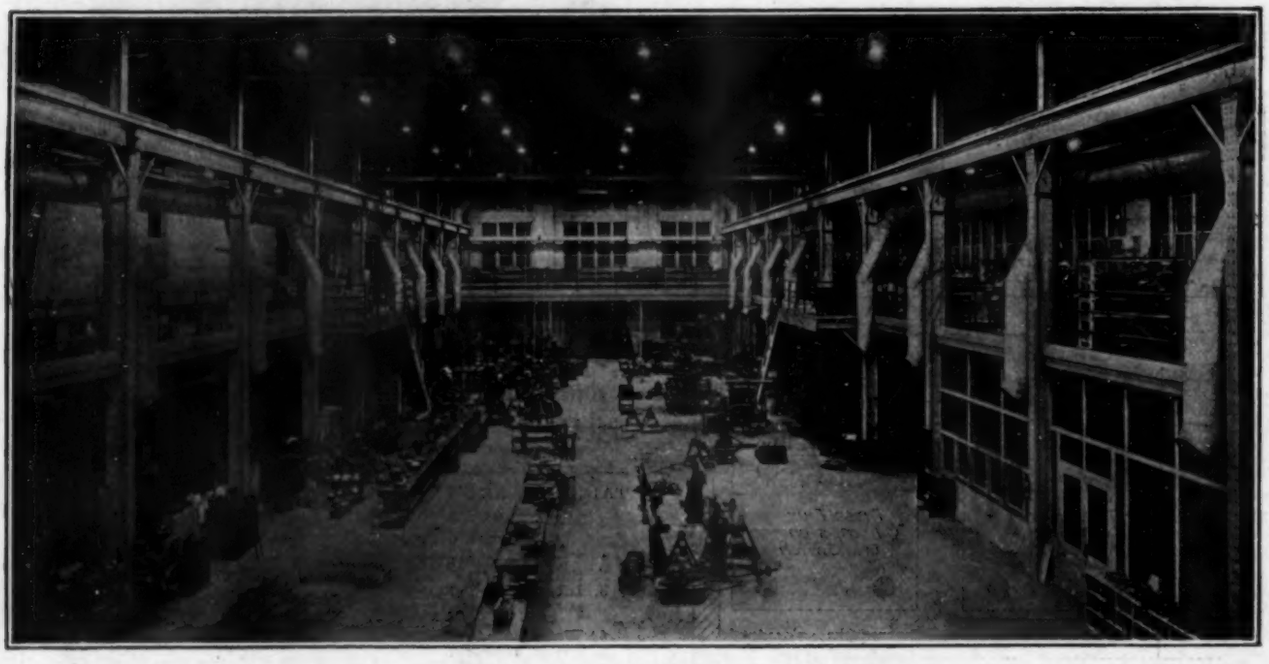


FIG. 8. EFFECT OF MODERN LIGHTING SYSTEM AT NIGHT

The scheme of control in Fig. 5 is much better than that of Fig. 4, since it breaks up the system into smaller groups of lamps and makes it possible to turn off the lamps near the windows while the space away from the windows still require artificial light. If the switches for the various groups of lamps in a bay are located on a column near the aisle, the foreman of a section can appoint someone to act as custodian of the lamps who will be responsible for turning off the lights. This

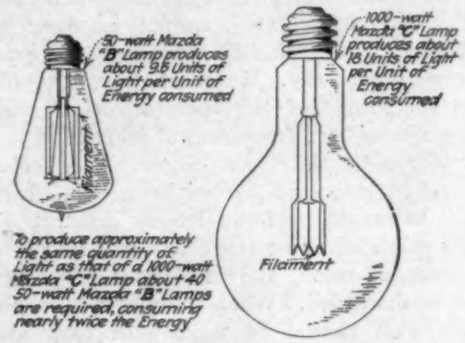

50-watt Mazda "B" Lamp produces about 9.5 Units of Light per Unit of Energy consumed
1000-watt Mazda "C" Lamp produces about 16 Units of Light per Unit of Energy consumed
To produce approximately the same quantity of Light as that of a 1000-watt Mazda "C" Lamp about 40 50-watt Mazda "B" Lamps are required, consuming nearly twice the Energy
Filament

FIG. 9. COMPARATIVE EFFICIENCY OF SMALL AND LARGE MAZDA LAMPS

economy, however, should never be allowed to keep the lights off when they are necessary, as this would hamper production and entail losses out of proportion to the coal saved.

The present efforts at conservation require attention in the use of fuel in the engine room; that is, in the reduc-

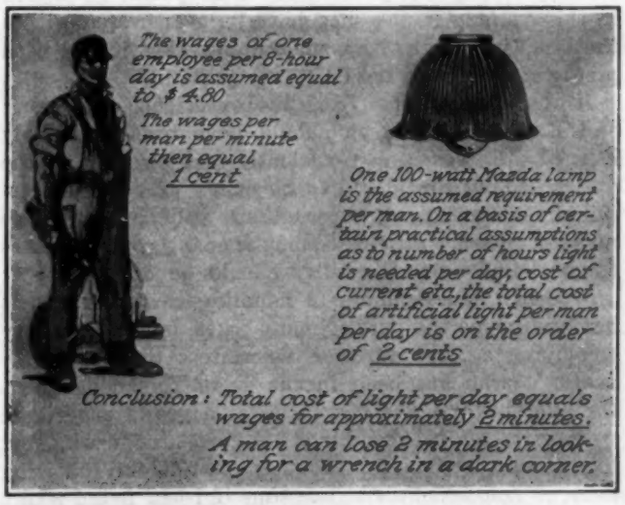

The wages of one employee per 8-hour day is assumed equal to $ 4.80
The wages per man per minute then equal 1 cent
One 100-watt Mazda lamp is the assumed requirement per man. On a basis of certain practical assumptions as to number of hours light is needed per day, cost of current etc., the total cost of artificial light per man per day is on the order of 2 cents
Conclusion: Total cost of light per day equals wages for approximately 2 minutes.
A man can lose 2 minutes in looking for a wrench in a dark corner.

FIG. 10. COMPARISON BETWEEN LIGHTING COSTS AND LABOR IN THE AVERAGE SHOP

tion of losses in the production of power and in the transmission and distribution of this power throughout the shop sections. So far as power for driving machinery is concerned, attention should be given to the method of applying the power to the machines themselves. Not only should the proper motor be selected to suit the machine tool, but its application should embody convenience in locating the control handle and such other details as those shown by Fig. 6.

In respect to shop lamps they should be efficient and reflectors should be employed, and these should be cleaned regularly to avoid a waste of light. In new shops the window areas should be large enough to make artificial light necessary only at night and at exceptionally dark-day periods. A shop like the one shown in Fig. 7, is properly provided for natural lighting, but even in such a place it should be remembered modern shop illuminants can transform it at night into one similar to that shown in Fig. 8, thus making a night shift a practical measure under war-time or normal conditions. It should also be noted that while the 50-watt Mazda lamp is more efficient than the carbon-filament lamp, as shown in Fig. 1, the larger Mazda lamps are much more efficient than the smaller ones. Fig. 9 shows where nearly 40 50-watt Mazda lamps are required to produce the same amount of light as one 1000-watt Mazda lamp; hence if a 100-watt unit is adaptable to the conditions only about one-half the energy is required as would be necessary if 50-watt lamps were employed. Economy of this kind cannot be taken advantage of in many cases, since the larger and more efficient lamp could not well be used under conditions of low or even medium-low mounting heights.

A word of caution is in place about too great enthusiasm in the saving of light. Fig. 10 indicates that only a relatively small amount of wages need be lost to offset entirely the cost of artificial light for the needs of an entire day. The foreman or whoever is in touch with the needs of the employees in a shop section should see that lights are not turned off if such a course will produce greater loss in another direction. With proper regard to these considerations and by applying intelligent effort to reduce losses, the conservation of the nation's fuel resources can be aided by just so much, always remembering that no economy is too small to merit other than careful attention—a principle that has vast possibilities if each individual will do his share.

Moral Responsibility for the Bursting of Grinding Wheels

BY ENTROPY

On page 767 of the *American Machinist* there is an article by Chesla C. Sherlock discussing the legal responsibility devolving upon employers and employees by the bursting of grinding wheels. Inasmuch as different states have different laws on industrial accidents and the interpretations of the technicalities and legal phraseologies differ so much between one court and another an article on the legal phase of this subject is bound to be of a somewhat contradictory nature and not of general application.

There is, however, a moral responsibility that is general in its nature, a few points of which an employer should keep in mind if he would avoid burdening his conscience in case such accidents occur.

Certain kinds of wheels seldom burst, but these are not among the most efficient on common work. On the other hand there are millions of wheels made every year which have all the good and bad points of a keg of gunpowder: they are perfectly safe if handled with discretion and common sense, but possess great potentialities for evil when ordinary precautions are neglected.

The ordinary wheels are pieces of pottery or vitrified ware in which are imbedded particles of abrasive,

usually artificial, very little emery being used for this purpose. They are made in the same way as any pottery product; that is, they are molded from a mixture of clay and abrasive, the proportions and kinds of which are determined by the individual maker's experience and depend upon the hardness of the wheel desired and the nature of the service to which it is to be put.

These wheels after molding are burned in a kiln where if the heat is irregular, if the cooling proceeds too rapidly, or if a cold blast of air reaches the heated wheels, some of them will break. If cold shuts are formed when the wheels are being molded the heat of burning will open them. It is also possible for impurities in the grain or bond to cause wheels to burst open during the burning process.

Opportunities for Cracks

After a wheel has come from the kiln apparently whole and sound there are still many processes, such as turning to shape, bushing, balancing, etc., through which it must pass before it is packed for shipment. In these stages there are many opportunities for it to be hit so that hidden or unnoticed cracks are started, and even after it has reached the customer there is still danger that it may be dropped and cracked, in which case the man who drops it will probably say nothing about it, as he is either unwilling to shoulder the responsibility for its subsequent action or ignorant of the probable consequences of the accident.

Thus when a wheel is mounted for service it is at best but a piece of pottery which, though it has been inspected and tested by its maker, has had many opportunities for injury since it left his hands. The tensile strength of the uninjured material is between 1000 and 1500 lb. per square inch, while if a crack exists the strength may be nothing at all.

The employer in whose service such wheels are used is in duty bound to allow only such operatives to use them who understand the attending dangers and know how to avoid them, and he is not justified in permitting an employee to operate any wheel without guards of tested efficiency and utility.

Rules for Operation

Every manufacturer of grinding wheels has copies of standard rules for their safe operation and which are distributed among his customers. Some of these copies get as far as the purchasing agent, some go to the waste basket, and some may reach the man who is responsible for the conditions under which the wheels are operated. In every shop these rules, or safety codes, should reach not only every foreman in whose department grinding wheels are used, but copies should be posted on the walls near the wheels so that persons operating them may see that the necessary precautions are being observed.

It is not an uncommon thing to see a workman in innocent ignorance, nullifying the efforts of the management to safeguard him, blocking a wheel away from the inner flange with small washers, so that the back of the wheel can be reached for some special job, or substituting smaller flanges in place of the regular ones for the same purpose. Sometimes he may put a wheel with an 1¼-in. hole on a 1-in. spindle without going to the trouble of providing a bushing to center it.

Of course all these makeshifts are temporary, but they are not infrequently allowed to remain until a workman comes along who is ignorant of the proper conditions and perhaps suffers serious injury by reason of another's carelessness and neglect. Above all things it should be considered a serious offense to remove a guard from a wheel or to start a wheel from which the guard has been removed for repairs. Adequate guards may be expensive, but they are much less so than the accidents they would have prevented.

Some jobs it is asserted, cannot be done with a guarded wheel, but if this be true they are good jobs to do some other way. In most cases the obstacle exists in the minds of the operator or of some one higher up who suffers from mental inertia.

Every wheel should be guarded. Every wheel should be thoroughly inspected before being placed on the machine. It should be hung loosely from the center as upon a screwdriver or other tool and lightly struck with a piece of wood, and if it does not ring clear it should be discarded. When the wheel is in place on the machine it should be used with care and due deference to its capabilities, remembering that it is ready at all times to revenge itself if it is abused.

Keep it under guard all the time. It is a good servant under proper discipline, but the price of its safe service is eternal vigilance.

Testimony for Women's War Work

By Luther D. Burlingame

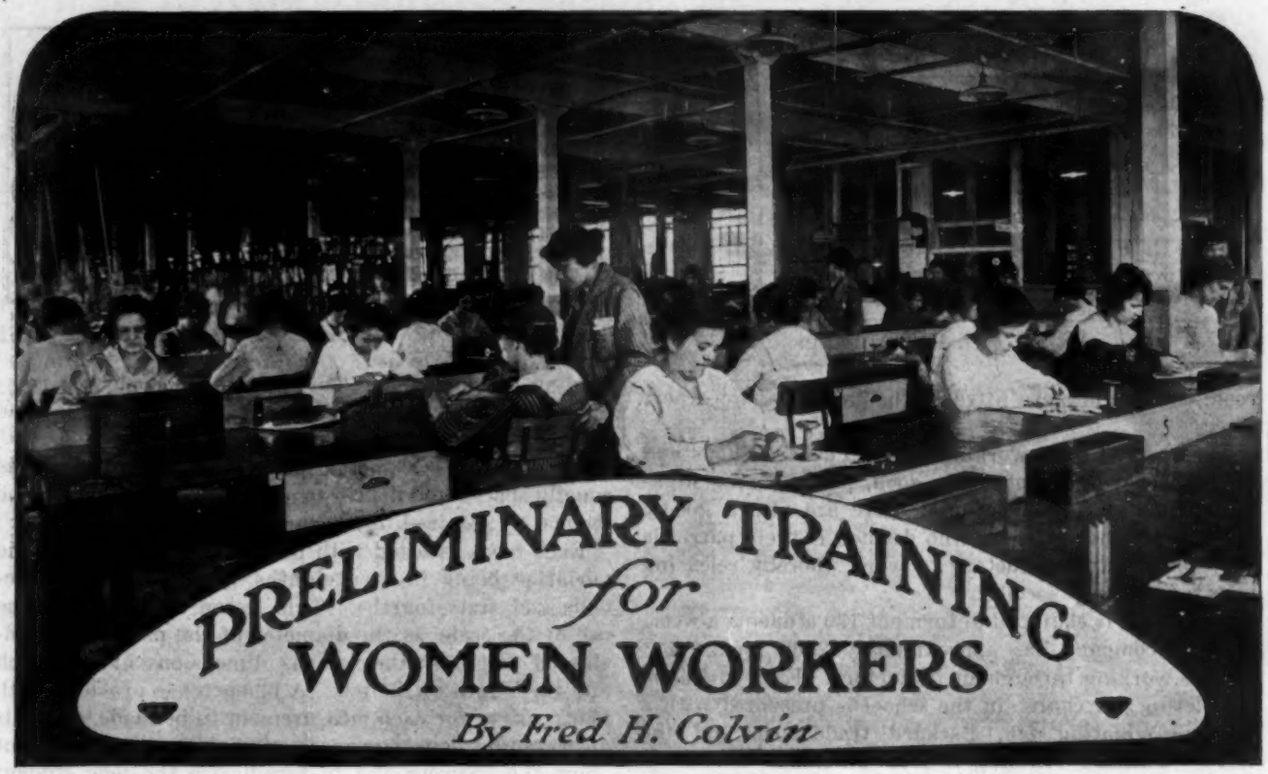
Many of the objections to the employment of women in this country in the shop have been answered within the last few months by women doing what it had been predicted they could not do.

It would seem that from the experience of France and England the lesson should have been previously learned that women can efficiently take up most of the duties usually considered to be men's jobs and in certain lines even excel, but as there still appears to be many doubters a little testimony showing concrete cases emphasizing women's ability should be of help.

Women's awkwardness in handling carpenter's tools has been made the butt of many jokes, but in a factory employing a large force of carpenters the "boss carpenter" (who has been in charge of this department for almost thirty-five years), after a year's experience with girls on various kinds of carpenter work, sent to the superintendent without solicitation the following note: "You asked me at one time if I had found where I could employ more girls. I now have 11 and they are all doing well. I find more things they can do every day."

It is believed that similar expressions in even stronger terms can be made by foremen of machine-shop departments and in many special lines that were not open to women until after America entered the war.

Because of the good news from the front some may think that efforts can be relaxed, nevertheless a real and substantial triumph can be attained only by continuing pressure to the limit, and the employment and training of women in mechanical industries promises to be a factor of great importance in speeding up production, so that the pressure may be kept up to that limit.



PRELIMINARY TRAINING *for* WOMEN WORKERS

By Fred H. Colvin

AN EXTENSIVE study of the methods of preliminary training necessary to fit women for work in the various departments of the shop has been made by the Packard Motor Car Co. of Detroit. It may not be out of place to state that the same methods are being used to train men of similar limited experience, but as the women predominate in about the proportion of 190 to 30 it may well be called a training school for women.

This school has been worked out as a part of the employment-management system of the Packard Co., which is in charge of E. A. Dryden, the employment manager. The training school originated with the general superintendent, D. G. Stanborough, and is under the direct supervision of W. J. Hammond. The school has a faculty of 50, not including foremen, assistant foremen and instructors, and is giving instruction in practically every line of work done in the factory.

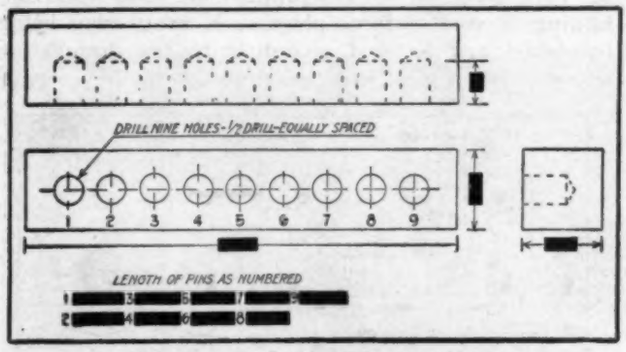


FIG. 1. TEACHING USE OF SCALE

One thing that the ordinary woman now coming into the factory does not realize is the importance of time. Everything connected with quantity production or with the work done and all operations provided are regular production work that is run on the same premium times as in the factory. This is done so that the students will understand the premium system used throughout the factory as well as realize that the element of time must be considered in everything they do.

Those in charge of the school have found by trial that the best results are obtained on machine and assembling work by having one instructor to every three students and in some cases one to every two, although on the elementary instruction one instructor to every six seems to work satisfactorily.

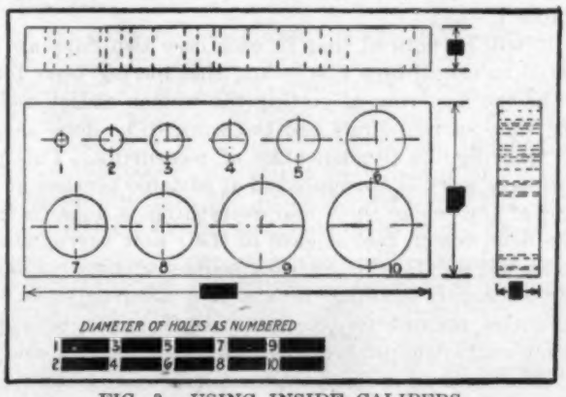


FIG. 2. USING INSIDE CALIPERS

After the students complete the elementary instruction and pass the examination in it they are furnished with two one-piece khaki uniforms, which are charged to them the same as their tools and which are returned to the company stockroom upon leaving the employ of the company. The employees may launder these uniforms themselves or turn them into the garment stock room in exchange for clean ones, where they will be laundered by the company at no expense to the student. These garments are all kept in the work-garment stock-

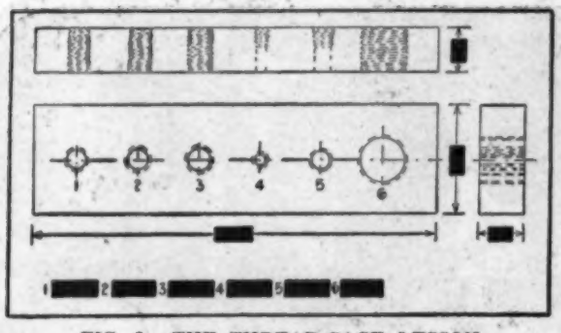


FIG. 3. THE THREAD-GAGE LESSON

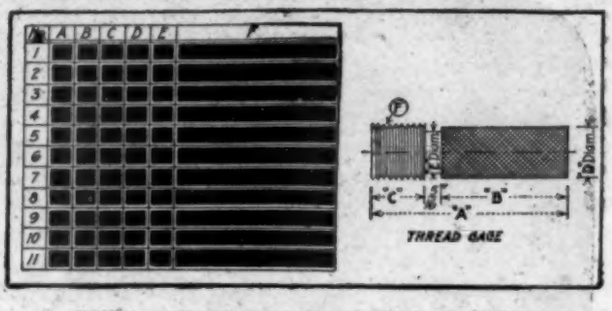


FIG. 4. MEASURING PLUG THREAD GAGE

room, where they are fitted to the employees by expert fitters.

The class of girls working in the Packard shops and in the school is exceptionally good, many having high-school and college educations; there are also a goodly number of schoolteachers who deemed it their patriotic duty to go into the factory to work, thereby releasing men for military service.

The school is equipped to turn out 120 students a week, and the company has approximately 2000 female employees working throughout its factory. Each girl upon completing her course in the school is presented with a silver graduating pin, Packard trademark, and the words "Packard Training School" on same.

The different courses taught are machining, welding, assembling, tool-crib work, clerical, inspecting, bench work, service-repair work, stockkeeping and stock tracing.

The standard course in the preliminary, or vestibule, training school varies from seven to sixteen days, according to the department to which the learners are to be transferred for actual work. A schedule of the training time for the different departments is shown in Table I.

It will be noticed that in each case two days are devoted to elementary inspection, this having been found to be the best way of getting the women accustomed to the shop surroundings and the work to be done as well as teaching the fundamentals of measuring. This preliminary work is accomplished at suitable benches at one end of the school shop, and everything is done to make the new women feel at ease in their new surroundings.

The elementary inspection course outlined in Table II consists of learning the use of measuring tools, such as scales, micrometers, calipers, depth gages, bevel protractors, thread-pitch gages, radius gages, etc., and the reading of blueprints. This is accomplished by a combination of blueprints and the articles themselves, some of these being shown in the illustrations.

Fig. 1 shows a metal block with nine ½-in. holes equally spaced and drilled to a uniform depth, which the student is required to measure.

Each block is fitted with pins of varying lengths, the variation being in even eighths, sixteenths, thirty-seconds and sixty-fourths. This lesson involves only the use of the scale, as the diameter of the pins is not considered, but only the various dimensions of the block and the length of the pin. A blueprint is provided with blank spaces for each measurement to be made, and this answers the double purpose of making it easy to put down the answers and to familiarize the new student with blueprints and drawings.

Lesson No. 2 involves the use of the scale as before and also the inside caliper, as the dimension of each hole is called for in the blank places shown (see Fig. 2). The use of thread gages comes next, these being simply for determining the lead of the screw. This is shown in Fig. 3, the plate having four holes tapped straight through and two holes with a taper-type thread. More complicated measurement is taken up in lesson No. 4, which is a plug thread gage, Fig. 4, and on which six separate measurements are taken. A number of different thread plug gages or plug thread gages are used in this lesson, a blueprint providing for 11 such gages should it be desirable to use this number.

The blueprints for lessons 5 and 6 are shown in Fig. 5. In addition to the blueprints there is a block containing 10 sets of three plugs each, every plug being numbered and lettered according to the designation shown. The student here learns to use the micrometer

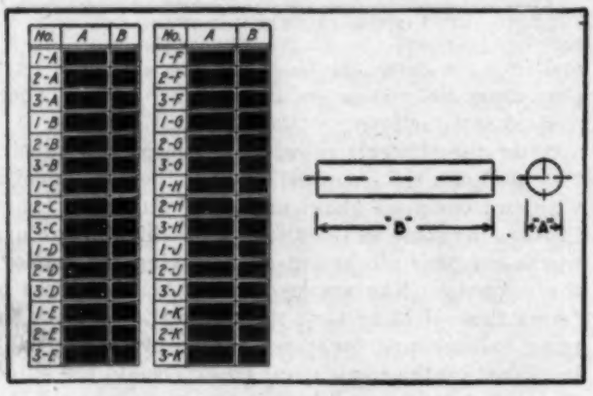


FIG. 5. MEASURING WITH MICROMETER

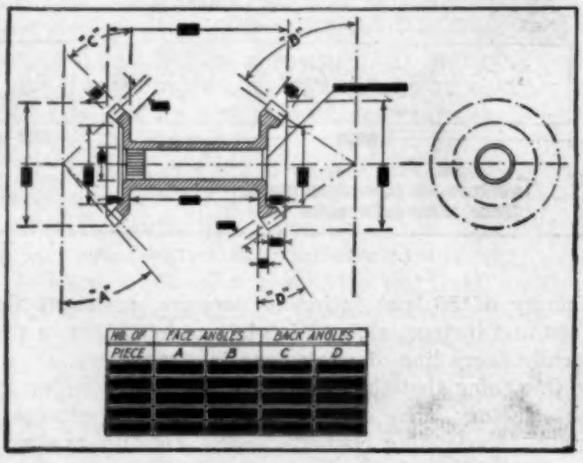


FIG. 6. MEASURING A BEVEL GEAR

in a practical way. One of the plugs of each set is the standard size for that set, and the other two vary by a thousandth of an inch in each direction; that is, one plug is a thousandth of an inch too small and the other a thousandth too large. In this way the student learns the functions of the micrometer and how to use it, becoming more or less familiar with it in a comparatively short time. The instructor shows how the instrument is handled and how the measurements are read, but does not inform the student of the variations between the different sizes of pins, so that it becomes a real test of measurement with enough repetition to make her fairly familiar with the micrometer.

Lesson 7 shows the use of the bevel protractor as used in connection with bevel gears, and also includes the use of the scale and caliper, all dimensions being marked down on a blueprint, Fig. 6, as before.

TABLE II. THE EIGHT STEPS IN TEACHING ELEMENTARY INSPECTION

	Hours
Inspection Lesson No. 1— Measuring pins and block with scale and marking sizes on blank blueprint	3
Inspection Lesson No. 2— Measuring plate and holes in plate with scale and calipers and marking sizes on blank blueprint	1½
Inspection Lesson No. 3— Using scale for measuring plate and thread pitch gages and scale for measuring threaded holes in plate and marking sizes on blank blueprint	1½
Inspection Lesson No. 4— Using scale and thread pitch gages for measuring threaded plugs and marking sizes on blank blueprint	1½
Inspection Lesson No. 5— Measuring pins with snap gages and marking sizes on blank blueprint	1½
Inspection Lesson No. 6— Measuring pins with snap gages and marking sizes on blank blueprint	3½
Inspection Lesson No. 7— Measuring bevel gears with protractor, scale and calipers and marking sizes on blank blueprint	1½
Inspection Lesson No. 8— Inspecting test shaft with gages used on all previous inspection points; also marking all sizes and notes on blank blueprint	4
Total	18

The last lesson is a combination of all the others and is a very complicated one for a beginner, as can be seen from Fig. 7. This is measured in 39 places, and blanks are provided on the blueprint for each dimension. Included in this is the measurement of counterbores, tap holes, beveled-gear angles, diameters at the bottom of grooves and at the outside of shaft and collar, the width of collar facing, radii, as well as the measurement of a taper shaft and the length of various portions of the shaft, which must check up with the over-all total. It is safe to say that anyone who can measure a piece of this kind correctly must have some understanding of the use of the various kinds of measuring instruments used in the shop.

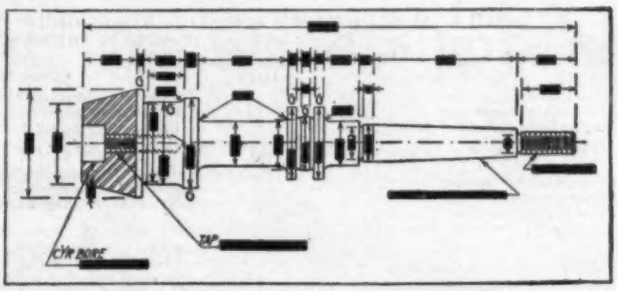


FIG. 7. LAST LESSON FOR BEGINNERS

The work also gives a fair grasp of the necessity of turning out accurate work on the machine and in general familiarizes the learner with some of the problems she will face when she begins production work.

After the women have mastered all the lessons of elementary inspection they are put at machines, also in the training school, and given the necessary instruction before going out into the shop on production work. The average time required for the various machines is shown in Table I, and it is gratifying to know that after going into the shops nearly all of them are making good. Where special coaching in certain lines is necessary it is given by competent and sympathetic instructors, and the foremen throughout the plant are coöperating to the full. The instructors in the training school are mostly women who have already become expert operators, some of these being shown in the headpiece attending a class in shop mathematics, which is a part of the instructors' course. The instructors are also taught the elements of mechanical drawing so as to enable them to read blueprints quickly and to explain them to the new students who are constantly augmenting the ranks.

One of the most interesting sections of the training school is that devoted to showing the learners how to assemble and repair Liberty motors. They take the engines down, examine the various bearings and other parts, reassemble them, learn how to set the timing gears for the motor and for the machine gun and otherwise to become familiar with the motor. They then have the satisfaction of seeing the motor run, this being

FIG. 8. THE MILLING MACHINE ROOM

FIG. 9. THE LATHES AND DRILLING MACHINES

TABLE I. TIME OUTLINED FOR STUDENTS IN GIRLS' PREPARATORY SCHOOL AND DIFFERENT OCCUPATIONS TO WHICH THEY CAN BE TRANSFERRED

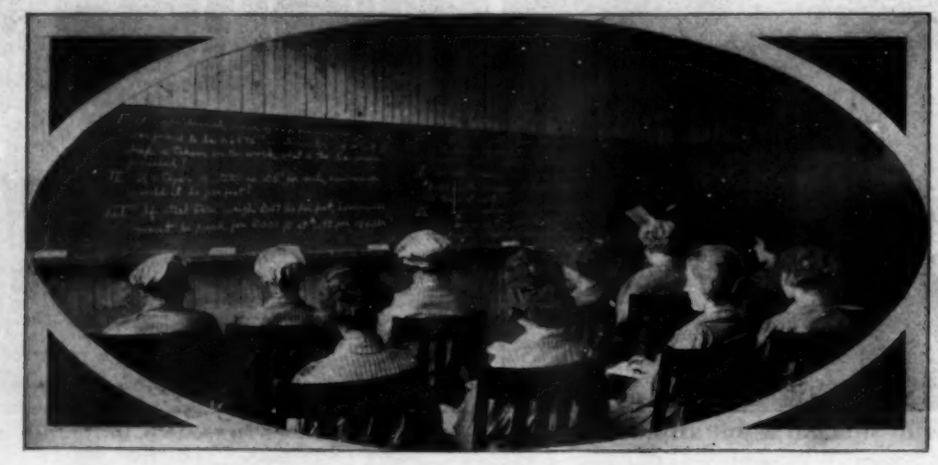
Occupation	Time, Days
Engine-Lathe Operators—	
Elementary inspection	2
Engine lathe	8
	10
Milling-Machine Operators—	
Elementary inspection	2
Plain milling machine	6
	8
Hand-Screw Machine Operators—	
Elementary inspection	2
Hand-screw machine	7
	9
Barber-Colman Gear-Cutting Machine—	
Elementary inspection	2
B-C gear-cutting machine	7
	9
Hand-Milling Machine—	
Elementary inspection	2
Hand-milling machine	6
	8
Sensitive Drill-Press Operators—	
Elementary inspection	2
Sensitive drill press	5
	7
Heavy Drill Press—	
Elementary inspection	2
Heavy drill press	5
	7
Multiple and Radial Drill—	
Elementary inspection	2
Multiple and radial	6
	8
Tapping-Machine Operator—	
Elementary inspection	2
Tapping machine	5
	7
Toolgrinding-Machine Operators—	
Elementary inspection	2
Universal grinding machine	6
	8
External Grinding-Machine Operators—	
Elementary inspection	2
External grinding machine	5
	7
Internal Grinding-Machine Operators—	
Elementary inspection	2
Internal grinding machine	5
	7
Splining Machine Operators—	
Elementary inspection	2
Splining machine	5
	7
Lo-Swing Operator—	
Elementary inspection	2
Lo-Swing lathe	7
	9
Fox Lathe Operators—	
Elementary inspection	2
Fox lathe	6
	8
Potter & Johnson Operators—	
Elementary inspection	2
Potter & Johnson	7
	9
J. & L. Operators—	
Elementary inspection	2
J. & L. machine	9
	11
Broaching Machine Operators—	
Elementary inspection	2
Broaching machine	5
	7
Inspection—	
Elementary inspection	2
Practical inspection	8
	10
Bench Work—	
Elementary inspection	2
Bench work	8
	10
Major Assembling and Dynamometer Test—	
Elementary inspection	2
Major assembling	7
	9
Minor Assembling—	
Elementary inspection	2
Minor assembling	6
	8
Welding—	
Elementary inspection	2
Welding	14
	16
Stock Tracers—	
Elementary inspection	2
Stock tracing	6
	8
Tool-Crib Attendants—	
Elementary inspection	2
Tool crib	6
	8
Foremen Clerk—	
Elementary inspection	2
Clerking	5
	7
Soldering—	
Elementary inspection	2
Soldering	5
	7
Stockroom Clerk—	
Elementary inspection	2
Premium and Production Clerks—	
Clerking	10

proof that their assembling and timing have been correctly and satisfactorily done.

The atmosphere of the place is very pleasant and has much to do with the success of the school.

In addition to training women for the Packard shops they are also successfully utilized in the service garages of some of the Packard distributing agencies in looking after repair details, from checking the cars into the station to that of seeing that everything is right before they go out. In the beginning they wash and polish cars, clean motors and parts, keep track of stock, check out tools and similar work, these often being done much neater than they were ever done before. They are also being prepared for heavier repair work by brief tutoring or acting as substitutes for skilled men. As a mechanic's helper a girl usually becomes capable of disassembling cars and trucks or their units in two weeks' time. The oiling and greasing, adjusting and repairing of springs, snubbers and shock absorbers, tire service and repairs, tramming and adjusting front wheels, adjusting brakes, adjusting valves and tappets, scraping and cleaning carbon, light tuning up of motors and many similar tasks are being satisfactorily mastered in from one to three weeks' instruction. Other repairs, such as to upholstery and radiators, are learned in a remarkably short time.

General views of the school are shown in the headpiece, where is the elementary inspection room, and in Figs. 8 and 9 which show the milling machines, lathes and drilling machines. Those in striped uniform are instructors, and a class of these is shown in the tailpiece being taught shop mathematics as a part of their course. They become very proficient and are thoroughly interested in their work.



Employment Department, Hog Island Shipyard

SPECIAL CORRESPONDENCE

The shortage of skilled labor has perhaps been more keenly felt in the shipyards than in any other industry. Prior to the war the shipbuilding plants of the United States could be tallied on one's fingers; a few weeks ago there were 200 in operation and more in contemplation.

THE lack of skilled ship workers was early impressed on the officers of the Hog Island Shipyard. Admitting the impossibility of obtaining efficient workers a training school was established by the Industrial Relations Division, where under the instruction of competent mechanics unskilled and semiskilled men, after a brief period of intensive training, could be transformed into specialists skilled in one operation or a small group of closely allied operations.

The training of efficient workers applies not only to men in the mechanical trades but to those in all departments of the yards and offices. To facilitate the selection of these men the Employment Department issued a pamphlet, excerpts from which are here published for the first time.

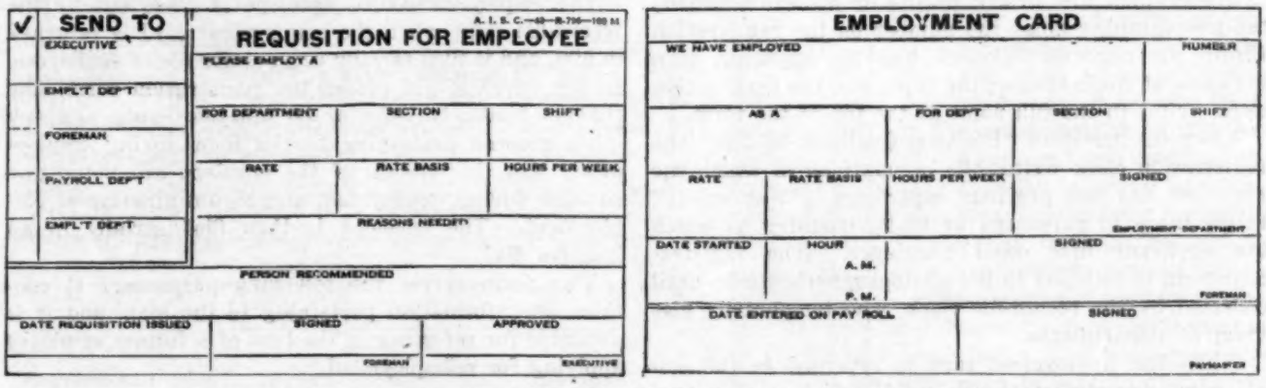
Beginning with his own department, the first to which the intended employee applies, the pamphlet outlines the physical requirements and duties of the workers in each department. To expedite the selection and proper classification of applicants who claim to have worked at any one of the trades at which employment is sought brief oral examinations have been sketched by men skilled in the various trades. With these questions and their answers before him the employing official can readily judge whether or not the applicant is trying to bluff his way into a job of which he is ignorant.

In the pamphlet each trade is described at length in a similar manner to that of "Bolter," which has been selected as an example.

The duties of the employment department with relation to the foremen are manifold and embrace the following: Filling promptly and satisfactorily their requisitions for labor; maintaining records of the employees' activities in the plant, such records to be available to foremen at all times; providing all employees with time cards and means of identification; fulfilling the requirements of the state with reference to the labor laws; investigating the references given by the applicants; interviewing all applicants, corresponding with them and maintaining a list of available applicants; reporting employment and labor conditions, and investigating all transfers, rate changes, terminations of employment and discharges of employees. This department is strictly a service department; its policies are based upon service, and to be of maximum assistance it must have the heartiest coöperation of the foremen.

Requisitions for an employee, illustrated by the obverse and reverse of the card, Figs. 1 and 2, are made out singly and signed by the foreman, but before sending to the employment department it is to be approved by the executive head of the foreman's department. The requisition clerk in the employment department sees that the card is completely filled out and signed and approved by the foreman and executives and sends it to the interviewers. Irregularities are straightened out by the requisition clerk. The interviewer hands to the selected applicant the requisition card after signing it in the space provided on the reverse side. The reverse side of the requisition card is the employment card. The registration clerk fills in the first section of the employment card, but not the number; the time-card clerk adds the number. The employment card is carried to the foreman by the man, accompanied by a dispatcher. The foreman signs the employment card as an acceptance of the man and forwards the card to the payroll department where the payroll clerks make the payroll entries, sign and date the card on the third section and returns it to the employment department. No applicant is placed on the payroll except through a completely filled out and properly authorized requisition and employment card. Finally the card is filed in an active file, according to name, by the record clerks in the employment department. On termination of employment the card is removed from the active file and filed alphabetically in an inactive file.

Thus it is apparent from the foregoing description



FIGS. 1 AND 2. OBVERSE AND REVERSE OF REQUISITION CARD FOR AN EMPLOYEE

that this form serves the following purposes: It advises the employment department that new help is needed; gives detailed information regarding the position to be filled; provides for the approval of the executive head of the department, thus giving a check on the new help hired; serves as a record of employment; serves as a cross-index of employees; shows that the new employee has started work, and shows that he has been entered on the payroll.

Figs. 3 and 4 duplicate the forms made out by the registration clerks when the applicant is accepted. The obverse side is filled in by the registration clerk with the exception of the number, and the reverse side shows the results of the physical examination. The physical examiner then fills in the results of his examination; the photographer notes the number on the registration form; the registration clerk has the applicant sign his name at the bottom of the form, and the registration clerk writes in the full name at the top of the form.

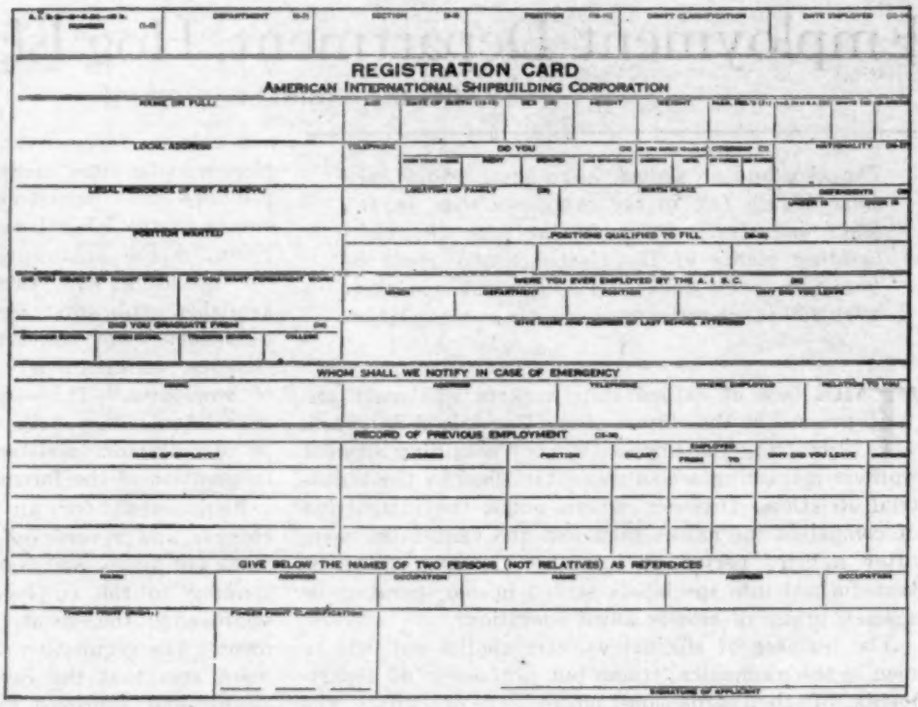

REGISTRATION CARD
AMERICAN INTERNATIONAL SHIPBUILDING CORPORATION
NAME (IN FULL)
LOCAL ADDRESS
LEGAL RESIDENCE (IF NOT AS ABOVE)
POSITION WANTED
POSITIONS QUALIFIED TO FILL
WERE YOU EVER EMPLOYED BY THE A. I. S. C.
WHOM SHALL WE NOTIFY IN CASE OF EMERGENCY
RECORD OF PREVIOUS EMPLOYMENT
GIVE BELOW THE NAMES OF TWO PERSONS (NOT RELATIVES) AS REFERENCES

FIG. 3. REGISTRATION CARD FILLED OUT WHEN APPLICANT IS ACCEPTED

After the question "Position Qualified to Fill" the registration clerk writes the occupations in which the applicant has had previous experience. "Nationality" refers more to parentage or to the country to which the applicant first owed allegiance. The registration form is retained in the photographer's studio until collected by the record-file clerk, who temporarily files them by departments.

When the employment card is returned to the employment department the record-file clerk removes the corresponding registration form from the temporary file and places it in an employee's record envelope. The purposes served by the form show: All personal information and previous employment records; physical record; the department, section, number, position and date of hiring; signature of the new employee.

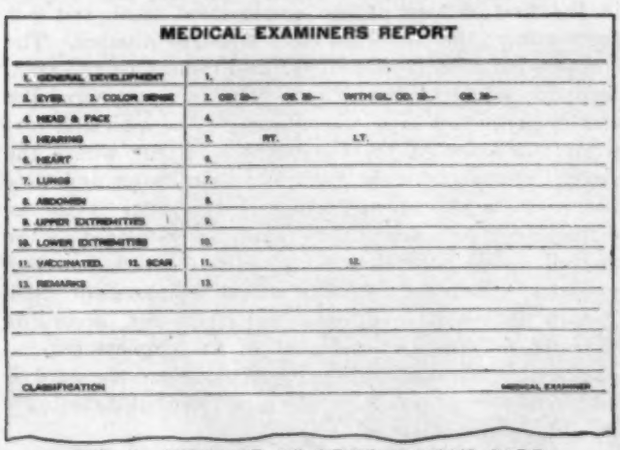

MEDICAL EXAMINERS REPORT
1. GENERAL DEVELOPMENT
2. EYES. 3. COLOR SENSE
4. HEAD & FACE
5. HEARING
6. HEART
7. LUNGS
8. ABDOMEN
9. UPPER EXTREMITIES
10. LOWER EXTREMITIES
11. VACCINATED. 12. SCAR
13. REMARKS
CLASSIFICATION
MEDICAL EXAMINER

FIG. 4. REVERSE OF REGISTRATION CARD

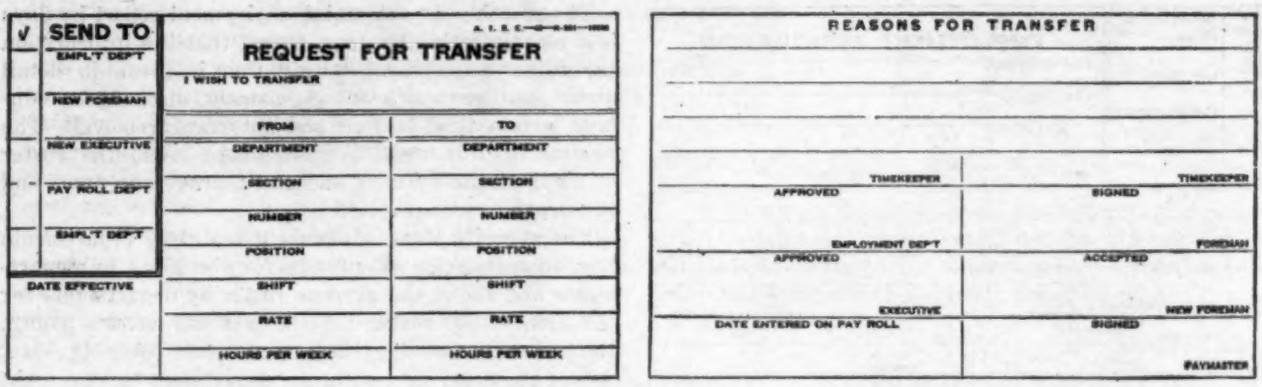
The employee's record envelope is made out by the record-file clerk when the employment card is returned to him, and is filed serially in an active file of employees. In the envelope are placed the registration form, any change-of-rate, transfer or termination cards, and any other records pertaining to the man during employment. On the outside of the envelope are noted any changes during employment and his termination of employment. The envelope is then filed serially in an inactive file.

This form serves the following purposes: It contains all information pertaining to the man, and it is available for reference in the case of a former employee applying for reëmployment.

Rules Governing the Use of Transfer Cards

The transfer card, front and back of which are shown in Figs. 5 and 6, is to be made out (excepting the left-hand section marked "Send to") by the foreman from whom the employee is being transferred. The foreman sends the card to the employment department, which after arranging for the transfer signs the card and forwards it to the new foreman, who adds to the card in the spaces headed "To" the new department, section, number, position, shift, rate and hours and signs the card. The time taken up in transferring employees is charged to the department to which the employee is transferred.

The card is then forwarded to the executive head of the new foreman's department for his approval. The executive forwards the card to the payroll department. The clerk in this department, after altering his records to conform to the change, dates and signs the card and returns it to the employment department. The record-file clerk in the employment department notes the change on the corresponding envelope and places the card in the envelope.



FIGS. 5 AND 6. OBVERSE AND REVERSE OF TRANSFER CARD

The uses of this form are as follows: It makes known to the employment department the desire to transfer an employee; gives a check on transfers; shows the new condition of employment; insures correct records by making it possible for each department interested in the change to get the information from one source of information.

The card headed "Request for Change of Rate," the front and back of which are shown in Figs. 7 and 8, is made out by the foreman, who sends it to the executive for his approval. The executive forwards it to the employment department, where it must be three days preceding the date of change. Changes of rate becomes effective only at the beginning of a pay period. After approval the employment department sends the card to the payroll department. The payroll clerk makes the proper payroll entries, dates and signs the card and returns it to the record-file clerk in the employment department, who makes the proper entries on the corresponding envelope and places the card in it. No change of rate is retroactive.

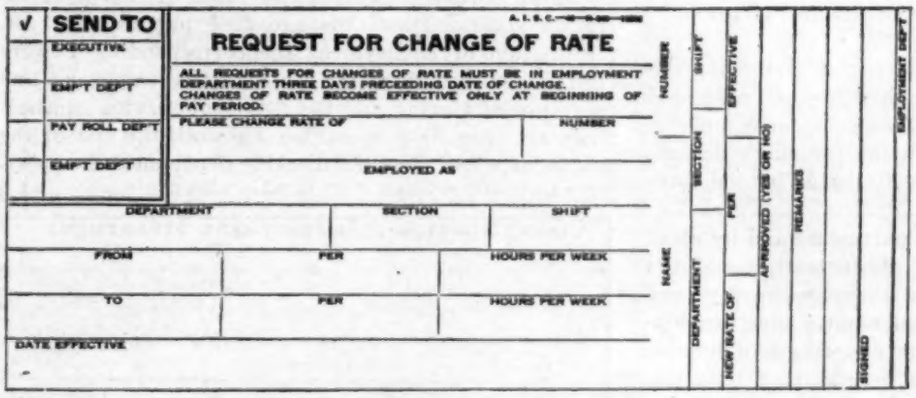


FIG. 7. CHANGE-OF-RATE CARD

This card serves as a request by the foreman for a change of rate for an employee; shows the position, present date and number of hours, and the proposed rate, number of hours and date the change should take effect; after approval by the executive and employment department the request is an authorized change of rate; shows the date that the payroll department received the card, and it makes it impossible to change the rate of any employee without proper authority and insures correct records.

The registration clerk writes the name of the employee on the department employee-record card, front and back of which are shown in Figs. 9 and 10, and forwards it to the foreman by the new employee. The foreman's clerk writes the department, section, position, number, shift, rate, etc., on the card, which is filed serially in the foreman's department. Any change in conditions of employment is noted on the corresponding card by the foreman. On termination of employment the foreman removes the card from his file, detaches from it the termination card, and after noting on the reverse side the service record and date of termination, files the department employee record in an inactive file. The termination card is forwarded to the labor-control division of the employment department by the foreman, and the labor-control division notes the results of its investigation and its recommendations on the reverse side of the termination card. If it is decided to discharge the employee the card is sent to the payroll department and the man is given his money. The payroll department returns the card to the employment department, where it is turned over to the record-file clerk. The record-file clerk makes proper entries on the corresponding envelope and places the card in the envelope, after which it is filed serially in a file of inactive employees.

This form serves as a file of active employees to be kept by the foreman; as a file of former employees to be kept by the foreman; it is a notice of dismissal or employment termination to the employment and payroll departments; it provides for the investigation and

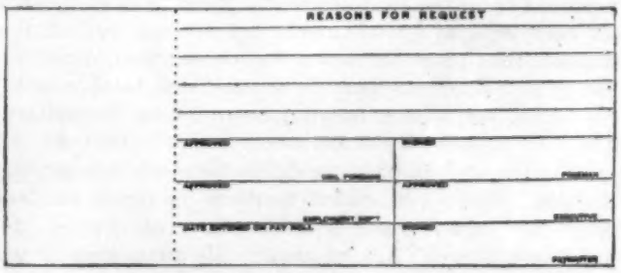
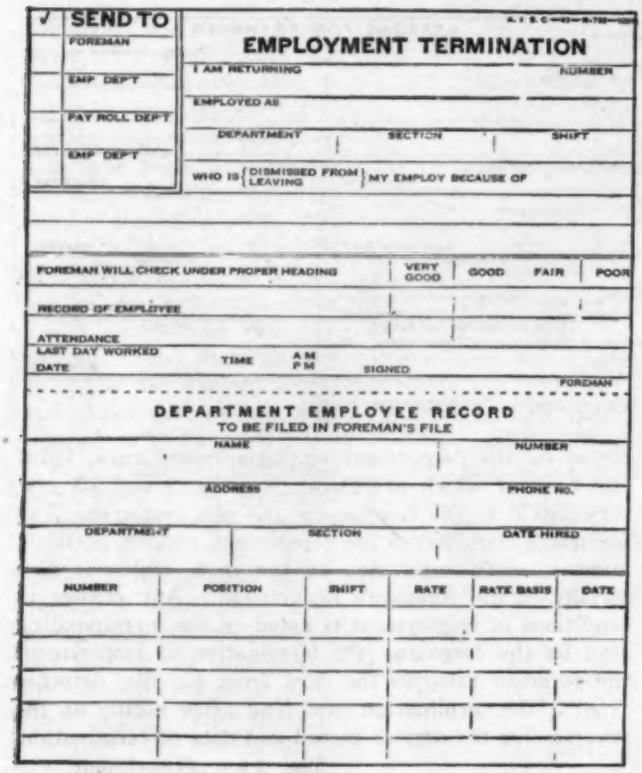


FIG. 8. REVERSE OF CHANGE-OF-RATE CARD



✓ SEND TO
FOREMAN
EMP. DEP'T
PAY ROLL DEP'T
EMP. DEP'T

EMPLOYMENT TERMINATION

I AM RETURNING NUMBER
EMPLOYED AS
DEPARTMENT SECTION SHIFT
WHO IS { DISMISSED FROM / LEAVING } MY EMPLOY BECAUSE OF

FOREMAN WILL CHECK UNDER PROPER HEADING | VERY GOOD | GOOD | FAIR | POOR
RECORD OF EMPLOYEE
ATTENDANCE
LAST DAY WORKED
DATE TIME A M / P M SIGNED
FOREMAN

DEPARTMENT EMPLOYEE RECORD
TO BE FILED IN FOREMAN'S FILE

NAME NUMBER
ADDRESS PHONE NO.
DEPARTMENT SECTION DATE HIRED

NUMBER	POSITION	SHIFT	RATE	RATE BASIS	DATE

FIG. 9. FRONT OF EMPLOYEE-RECORD CARD

recommendation by the employment department; the fact that the department employee record card and termination card are attached insures a correct file of active and inactive employees in the foreman's department, and it affords a check on discharge by the foreman.

Statistical reports show by departments and by plant recapitulation the force report, the entrances and the exits and the working force and absentees by days and by monthly averages. Analytical reports show employment terminations by reasons, the age, length of service, nationality, citizenship, housing conditions, marital relations and other pertinent information regarding the termination. This information is of great help in determining the most desirable class of employees.

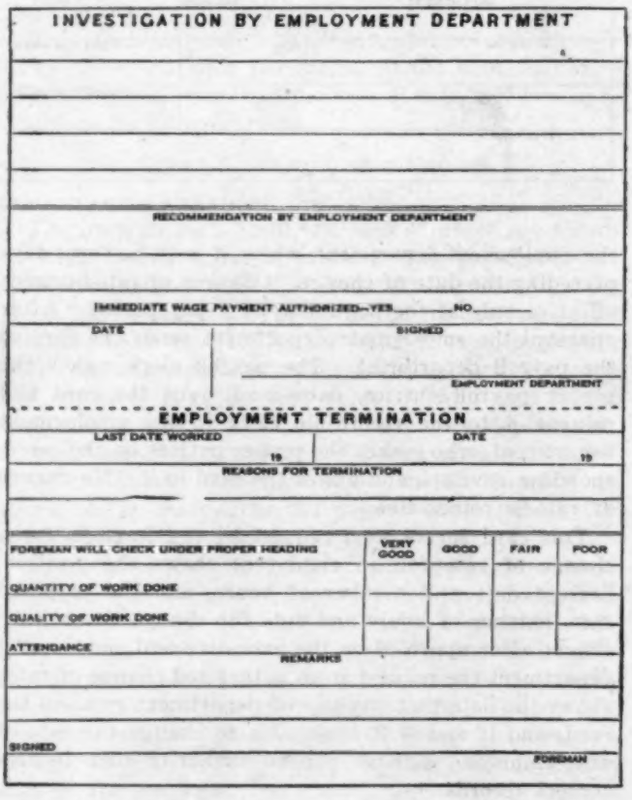
The reports by occupations show the number of men of each occupation on the roster for the day previous; the number of each occupation hired, rehired, and transferred into the department; the number of each occupation discharged; the number of employees of each occupation who voluntarily terminated their employment with the company; the number of the employees of each occupation who were laid off and the number of employees of each occupation who were automatically removed from the payroll and the number of employees of each occupation who were transferred out of the department; also the roster for the current date, the net gain or loss of each occupation, the total number of employees absent for the day of each occupation, the total number of employees absent for that day by occupation and the net working force by occupations for that day. This report is made out from employment-department records with the exception of the number absent. This information is furnished by the payroll department from the time-card check.

The monthly departmental employment report by days is a recapitulation by days, except that the information regarding employment termination is given in detail under four general headings, namely, discharge, voluntary termination, laid off and automatic removal. The routine of this work is also given. Also the roster of employment by days and the average absentees and the department turnover.

The monthly plant-employment report by departments is a recapitulation of reports for the plant by departments and shows the average roster by departments for the month, the roster for the last day of the month, the net gain or loss by departments over the last day of the previous month, the department turnover, the total number of absentees for each department for the month and the daily average absentees for the month and the plant turnover.

The monthly plant-turnover analysis shows by description four general reasons for termination, namely, discharge, voluntary termination, laid off and automatic removal; the number of terminations for the month, total number to date, and analyzes the foregoing by age, sex, citizenship, housing conditions, marital relations, dependents and previous experience. This information is taken from the Powers card.

When an employee is hired a Powers card, shown in Fig. 11, is punched for him, giving all the information as shown. This information is taken from the registration sheet. The cards are filed numerically. On termination of employment the corresponding Powers card is removed from the file of active employees and the cause of leaving and the length of service punched. They are then filed in another file until the end of the month, at which time the monthly departmental-employ-



INVESTIGATION BY EMPLOYMENT DEPARTMENT

RECOMMENDATION BY EMPLOYMENT DEPARTMENT

IMMEDIATE WAGE PAYMENT AUTHORIZED—YES_____NO_____
DATE SIGNED
EMPLOYMENT DEPARTMENT

EMPLOYMENT TERMINATION
LAST DATE WORKED 19 DATE 19
REASONS FOR TERMINATION

FOREMAN WILL CHECK UNDER PROPER HEADING	VERY GOOD	GOOD	FAIR	POOR
QUANTITY OF WORK DONE				
QUALITY OF WORK DONE				
ATTENDANCE				

REMARKS

SIGNED
FOREMAN

FIG. 10. BACK OF EMPLOYEE-RECORD CARD

ment, monthly plant-employment and monthly plant-turnover analysis reports are compiled.

In connection with the Powers card a comprehensive table, which serves as a key to the use of the card, is furnished, together with a list of occupations of the various workmen comprising bitumastic coaters, boilermakers, calkers, cementers, chippers, drillers, electricians, erectors, joiners, holders-on, machinists and all-around machinists, painters, pipe fitters, plumbers, reamers, riveters, ship fitters, ship carpenters and stage builders.

Two other matters of interest to foremen regarding the employment of men are the descriptive form and the oral examination. The first explains the occupation and the requirements, and the second is a list of questions asked to determine the applicant's experience, examples of both of which are subjoined:

BOLTERS

OCCUPATION

Description—Bolters must bolt all plates, frames, brackets, iron decks, etc., securely after the erectors have set them in place.

Character—Bolters, after bolting up work, must again bolt up the members after the reamers, so that all holes may be properly reamed. The work must be done carefully, particularly at final bolting, to insure a tight fit.

Location—Bolters work on all parts of ship from stem to stern. Sometimes they are compelled to work in close quarters, such as in the inner bottom.

Organization—Two men in a gang.

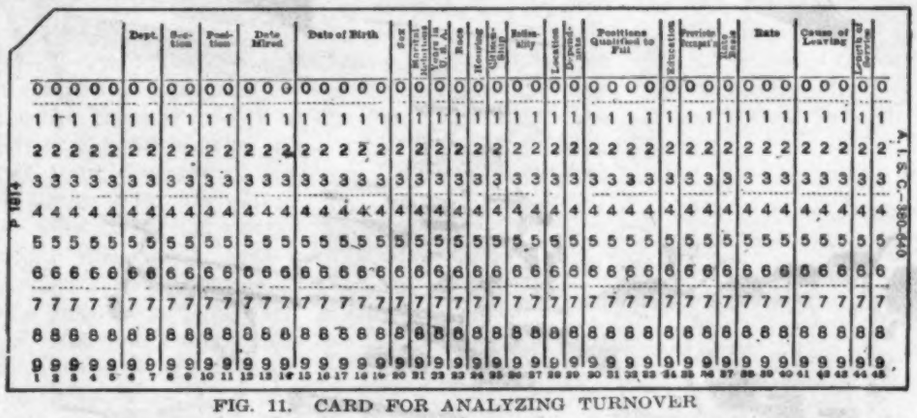


FIG. 11. CARD FOR ANALYZING TURNOVER

REQUIREMENTS

Physical—While the work is not particularly heavy, bolters should be strong, ablebodied men, willing to work out of doors and able to do climbing and work from staging.

MENTAL

Little or no education is required, but bolters should be intelligent, willing workmen.

EXPERIENCE

Skill in bolting may be acquired in a short time, but men with similar experience are preferred.

ALLIED TRADES

Men who have had experience on structural iron work, such as bridge builders or structural iron fitters or erectors, or who are experienced in heavy sheet-metal shops, are easily trained for bolting.

ORAL EXAMINATION FOR BOLTERS

Q. Did you ever bolt up on the shell of a ship, and do you work ahead or after reamers? A. Both, particularly on shell plating.

Q. Have you worked on decks, and what are the decks of a ship? A. The same as floors to a house.

Q. Did you ever work on the floors of a ship, and what are they? A. Vertical plates and frames between inner bottom and shell plate, running transversely.

Q. Where are the longitudinals, or intercostals on a ship? A. Running parallel to the vertical keel.

Q. Where is the center keelson? A. At the center line of the ship.

Q. What kind of tools do you use on ¾-in. bolts, and what size? A. Solid wrenches, 1-in. jaw.

Q. What is a flogging hammer? A. A heavy hammer.

Q. What do you call those things that you stick in the hole and drive? A. A drift pin.

Q. Did you ever bolt up a hawse pipe, and what are they? A. A casting with a hole through which the mooring cable or chain passes.

Q. On what end of the boat are they located? A. Forward.

Q. After a plate is bolted on a ship what follows? A. Reaming and countersinking.

Q. After this what is done by the bolter? A. He changes bolts from holes not countersunk to those that are, so all holes can be faired and countersunk.

Q. How close have you been accustomed to bolt up work? A. So the two surfaces are perfectly tight previous to reaming.

Q. About how many bolts would you and your partner put in a shell and thoroughly bolt up in one day? A. About 20 bolts an hour.

Q. Where is your partner working on ship? A. On the opposite side of the plate.

Q. What does he do? A. He pushes the bolt through the hole where directed and holds the head of the bolt with a wrench to stop it from turning.

Q. What kind of a wrench does he use? A. The same as the bolter.

A simple examination such as this, covering any of the trades mentioned, would not be difficult for the skilled, or even partly skilled, man to pass, but one who was ignorant of the trade would be unable to make a showing.

Draftsman or Engineer

BY B. H. WALKER

While there is truth in the statements in the article by G. J. White on page 907, I believe the most important of all reasons, namely, compensation, was not discussed as thoroughly as it might have been. In reading advertisements in technical papers and talking with people that are conversant with the situation my attention is daily brought to the need of good designers at a salary of from $30 to $40 a week at the beginning, payable in many cases by the hour with a week of from 48 to 59 hours. In a recent issue of a daily paper there was an advertisement for plumbers which offered wages of $35 a week of 44 hours to start with, and while these are war wages the proportion had held good for years. A bricklayer, toolmaker, steamfitter, or plumber gets equally as good wages as a designer, if not better. Is it any wonder then that a man after spending the best four years of his life in college or studying long hours after completing a day's work hesitates to take a position that will after several years' practical experience only bring him the wages of the above workmen at the start?

A designer must have as much knowledge as a lawyer or doctor, but he does not receive half the compensation.

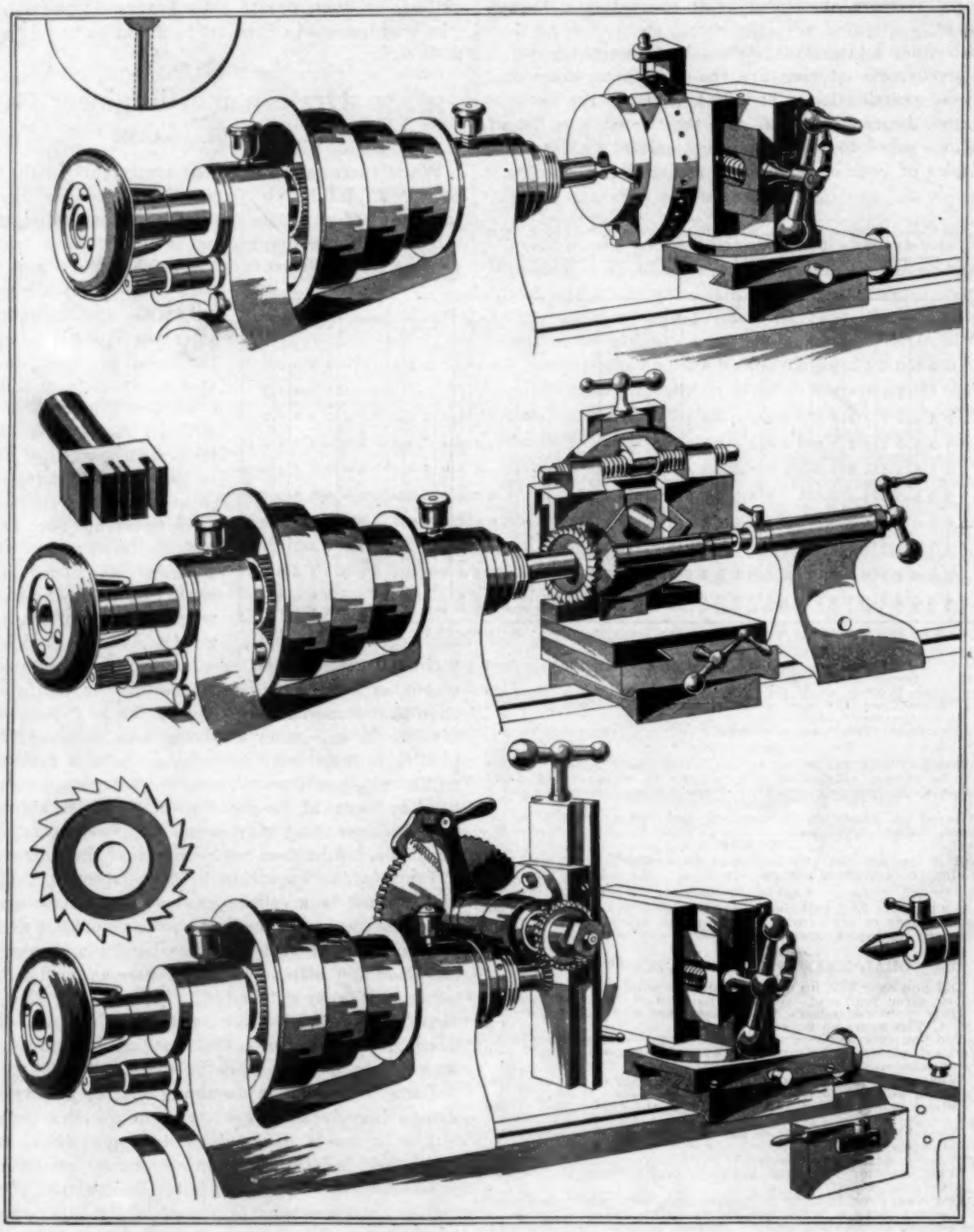
I must take exception to the statement that a designer must be a college graduate, as I have seen non-graduate designers as good as graduates. Does Mr. White not know that it is possible for any man having ambition and little money to become as good a designer as any that ever graduated? Is it possible that he has never met any of these men, or is he one of those graduates who believe that having gone through college he has nothing more to learn?

I may be wrong in assuming that he believes a man cannot become a designer without a college education, but as he makes this statement in more than one place in his article I think my impression is justified.

His remedies are good, but I believe that if the pecuniary end was what it should be the other conditions would take care of themselves, and that this condition is something that should be remedied, as no country can allow a scarcity of designers to exist without seriously affecting its industrial life.

FOR SMALL SHOPS *and* ALL SHOPS

By J. A. Lucas



METHODS BY WHICH A BENCH LATHE MAY BE UTILIZED FOR A NUMBER OF SMALL MILLING JOBS

The Manufacture of Diamond Transmission Chain

By J. V. HUNTER, Western Editor *American Machinist*

In assembling transmission chain, machinery is used as far as possible to take the place of hand labor, and where this is not possible devices are used to aid the necessary manual operations. This article shows how the labor of assembling has been reduced to a minimum by the use of automatic and semi-automatic machines.

Part IV. Assembling Work

WHILE the assembling of chain is largely done by machines in the shop of the Diamond Chain Co., Indianapolis, Ind., some hand labor is used in gathering parts and so arranging them that they may be properly placed in machine magazines. The girl in Fig. 38 is using a four-tined fork for stacking side links preparatory to placing them on magazine feeder rods for one of the machine assembling operations. She rapidly pushes the fork through the pile of side links in the bin before her, and as the pointed tines come in contact with the holes the links are strung upon the tines like so many beads on a thread. After about 20 quick passes the four tines will be full of links, each strung through one end, the tines being spaced far enough apart so that there can be no possibility of two tines catching both holes in one link. The links, when strung, hang down in an even pile from the tines, and it is easy to pick off each pile and string it on one of the rods *A*. These rods are doubled like hairpins, so that the ends pass through both holes in the links. A number of these strung rods are shown lying at *B*.

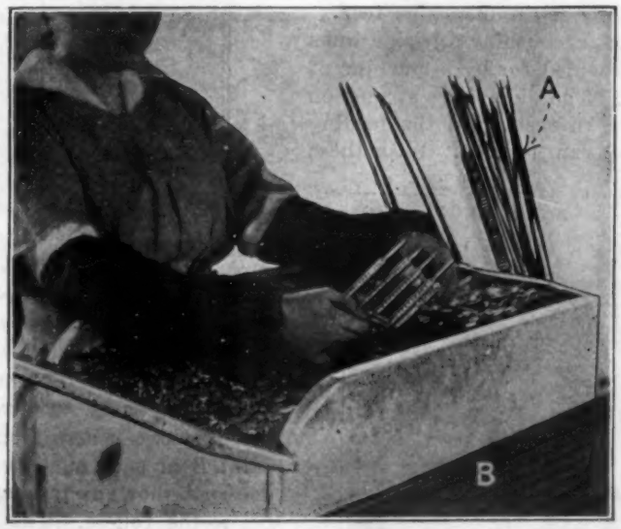


FIG. 38. GATHERING SIDE LINKS FOR ASSEMBLING MACHINES

Rollers and bushings are also strung on rods in order to feed them automatically to the assembling machines, the device used for stringing them being shown in Fig. 39. The loose bushings are placed in the revolving pan *A*, and the magazine rods *B* are held by one end in a special rack *C*, and the other ends project into the mass of bushings in the pan. As the bushings come in contact with the pointed ends of the magazine rods the force of the revolving pan pushes them up on the rods until in an incredibly short time the rods are completely filled. Three or four of the rods may be put on the rack at one time, and they are filled almost as soon as the operator can remove and replace them with others. Some of the filled rods are shown standing on end at *E*. The bin *D* is provided with a small shutter at the bottom through which bushings are fed into the pan.

Fig. 40 is an outline sketch showing some of the different operations used in connection with the assembling of chains. Practically all of these operations are steps in connection with different stages of machine-assembling operations, and reference will be made to the figure from time to time as the work progresses. The first operation at *A* and *B*, the latter with the pins pressed into a side link, is performed by the machine shown in Fig. 41, which is practically automatic in its operation. The loose pins are dumped into the hopper at *A*, where by a jolting motion they are caused to slide down the magazine tubes. The side links shown at *A*, Fig. 40, have been strung on magazine wires extending through the two holes and are seen hanging at *B*, Fig. 41. The circular disk *C*, with notches at specified points in its circumference, revolves around the center *D* and carries on its periphery the different parts which make up the assembly as shown at *A*, Fig. 40. As the motion of this disk brings certain points underneath the magazine column *B*, Fig. 41, a feeding ram actuated by a cam at *E* slides one of the side links into an indentation on the under side of the plate *C*. When the point where the side link has been placed reaches the point beneath the pin-magazine column *F* another feeding attachment places the two pins in notches in the rim and vertically in line with the holes in the links.

The rotary movement carries each pair of pins, with a link below them underneath the punching machine ram at *G*, and as the plate momentarily stops in this position the ram descends and drives the pins into the

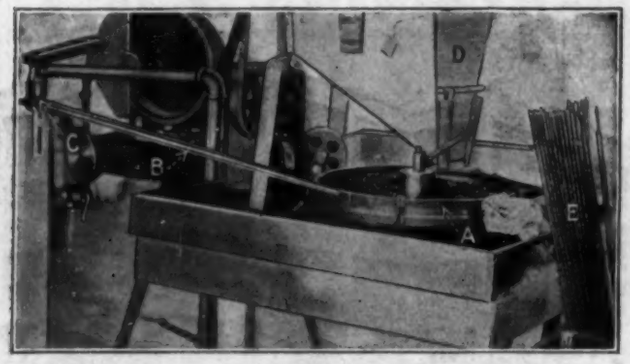


FIG. 39. STRINGING ROLLERS ON MAGAZINE RODS

holes in the side links. The holes in the side links are 0.003 in. under the diameter of the pin. This makes a tight fit and prevents the pins from falling out during subsequent operations.

Assembling Bushings and Side Links

Pressing bushings into side links as shown at *C* and *D*, Fig. 40, is similarly performed, the only difference being that the bushings are strung on feeder wires to put them into correct position for the magazine feed.

The placing of larger sizes of bushings in side links as detailed at *E* and *F* is provided for by a machine of the type shown in Fig. 42. The side links strung on magazine feed wires are shown resting in the feeding position at *A*. The pressing ram is at *B*. With these

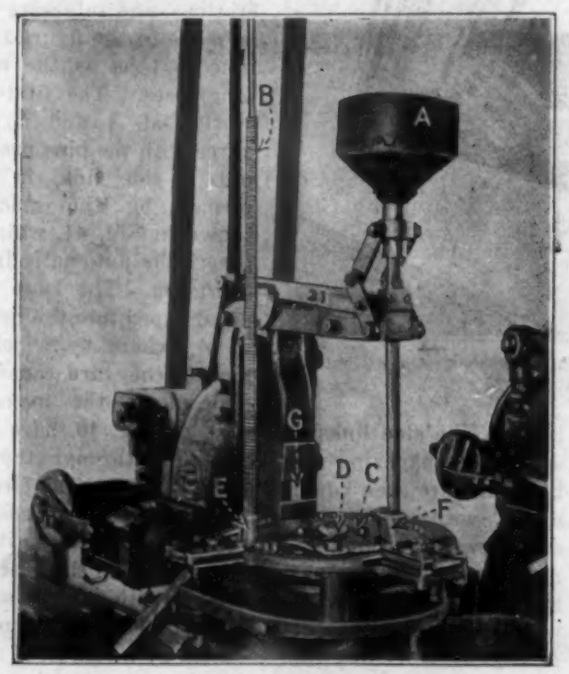


FIG. 41. PRESSING PINS IN THE SIDE LINKS

larger sizes it has been found advisable to feed the bushings by hand, and the operator is placing them in the notches of the revolving plate *C*. The operation is very similar to that of pressing in the pins, for as the plate revolves it comes beneath the punching-machine ram, and the bushings, which are slightly greater in diameter than the size of the holes in the links, are squeezed into place.

In Fig. 43 a similar operation is being performed on a larger size of chain, the completed links being shown standing on the table at *A*. This machine also requires a hand feed for the bushings, although the side links are fed by an automatic device operated by a wobble cam *B* on the crankshaft, which gives a reciprocating twisting motion to the shaft *C*.

The parts at *G*, Fig. 40, consisting of side links, bushings and rollers, are pressed together into the form shown at *H*. The bushings are a tight press fit in the

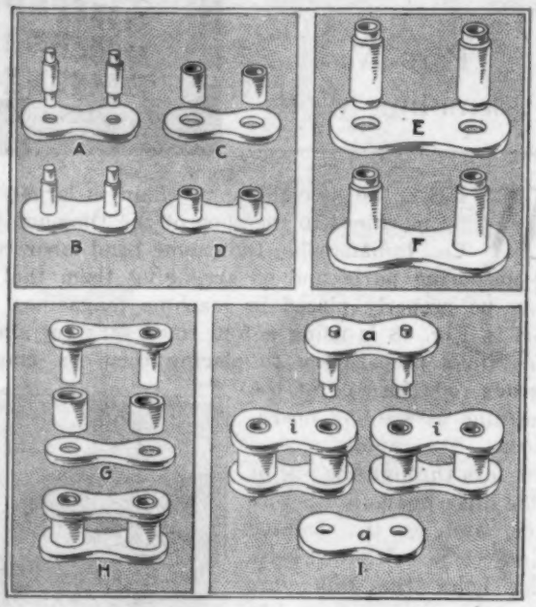


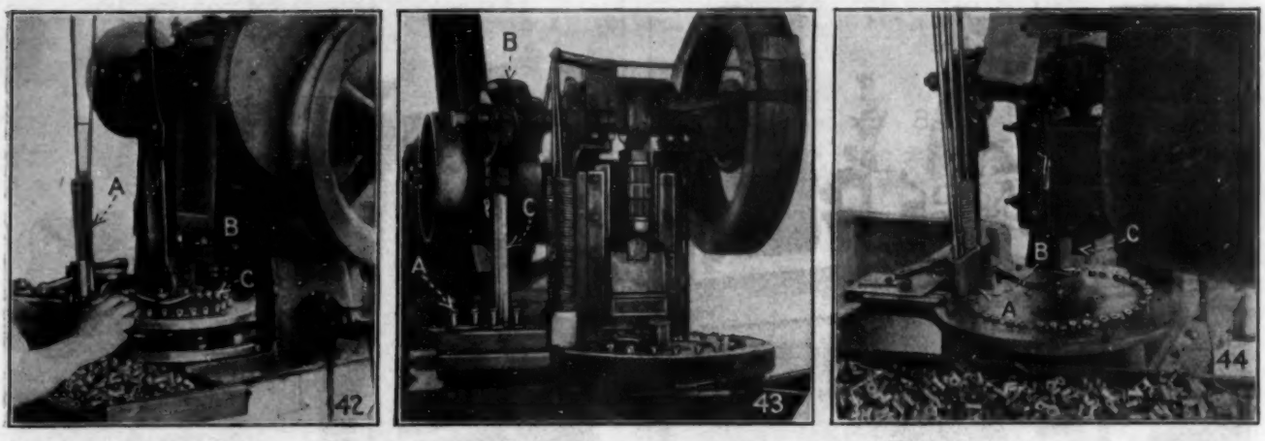
FIG. 40. DIAGRAM OF OPERATIONS IN CHAIN ASSEMBLING

side links and the rollers are slipped over them, being of a sufficiently loose fit to permit them to revolve when the chain is in service.

Fig. 44 illustrates one of the machines for assembling these parts. The revolving disk *A* receives a side link and two rollers from the magazine hoppers at the point *B* at each movement of a ratchet. The side link does not show, as it is on the under side of the disk *A* below the rollers. The side links with the two bushings already pressed in place as shown in the upper part of *G*, Fig. 40, are in the pan, Fig. 44, and the placing of them in position is a hand operation. The bushings attached to the side link are placed in the rollers as they pass the front of the machine, and are carried around by the table and under the ram *C* and are pressed into place, thus making the completed unit as shown at *H*, Fig. 40.

Naturally the small steel parts are continually dropping on the floor about the operators and machines, and were these swept up with a broom they would become full of dust and dirt. For picking these up the magnet shown in Fig. 45 is used. This is a heavy horse-shoe magnet with a long wooden handle, so that it may be used like a broom.

The final assembling of the chain, which includes the part as shown in *I*, Fig. 40, is done on long steel-topped



FIGS. 42 TO 44. ASSEMBLING BUSHINGS AND ROLLERS

Fig. 42—Hand-feeding bushings in assembling machine. Fig. 43—Assembling machine showing reciprocating movement. Fig. 44—Assembling rollers on side links and bushings

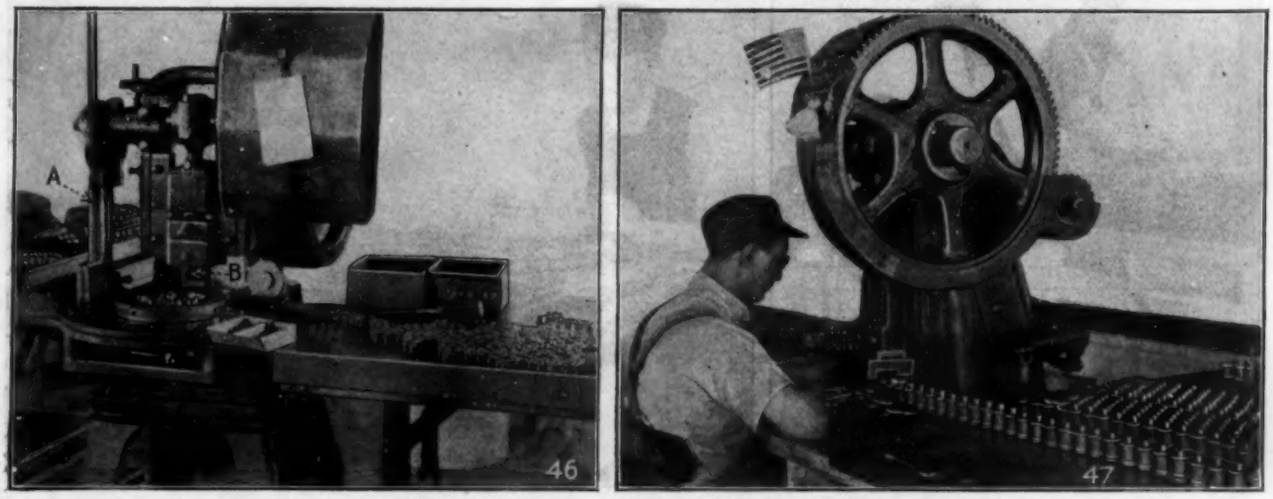
tables by girls who rapidly place the different pieces in series with one another, making them up in lengths sufficient for each job for which the chain is specified. These tables are directly connected with the final pressing machine as shown in Fig. 46. The roller-link combinations, similar to that shown at *i*, Fig. 40, are laid in series and connected together by the pin-link combination at *B*. These are fed into the machine shown in Fig. 46, which has a revolving sprocket of the same character as the chain would run over if it were in actual service. On the under side of this sprocket are receptacles that carry side links from the magazine *A*.

Spinning Heads on Pins

As the sprocket meshes with the chain being fed to it the links it carries line up with the ends of the pins, and when finally the chain is carried beneath the plunger *B* the pressure put upon it forces all together so that it is held securely until the chain can be carried to the machine which does the final spinning of the heads on the pins.

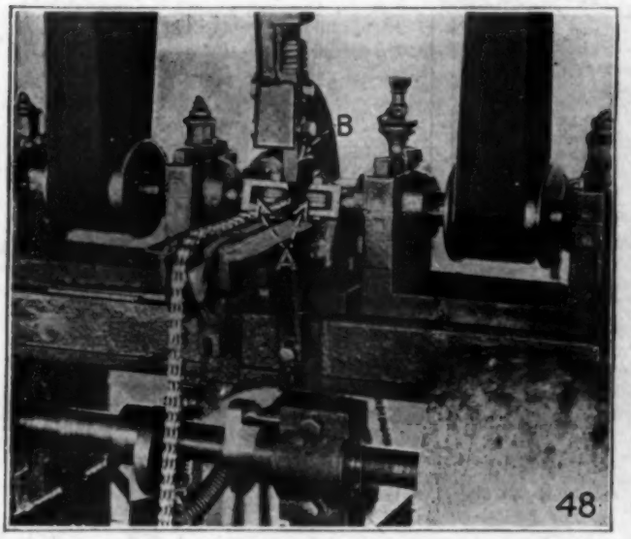
A larger type of chain is being handled by the machine shown in Fig. 47 and by a method that is the reverse from that which we have just described. By this method the rollers and links are stood on the links with the pins, and the operator places a loose link on the top of each pair of pins before it enters the pressing

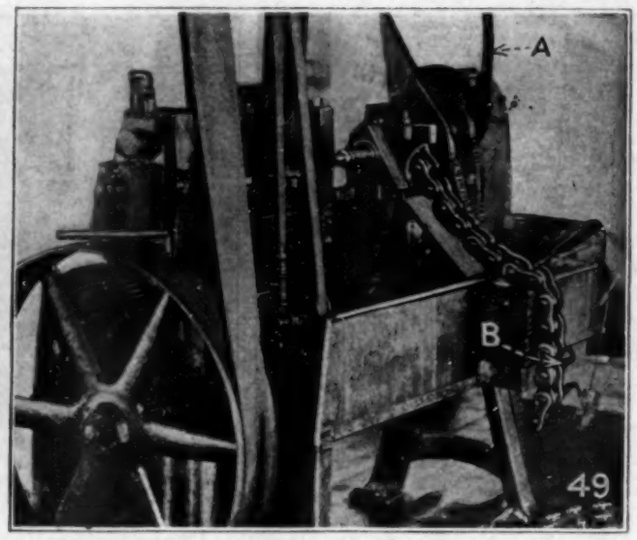
FIG. 45. MAGNET FOR PICKING UP STEEL PARTS



FIGS. 46 AND 47. ASSEMBLING OPERATIONS

Fig. 46—Final assembling of small and medium sized chain. Fig. 47—Final assembly of large chain





FIGS. 48 AND 49. SPINNING RIVET HEADS ON PIN ENDS

die. This last side is held in place finally by a cotter pin so that it is only necessary to spin over one end of each rivet.

After the final side links have been pressed on the ends of the pins are headed by spinning in the machine shown in Fig. 48. After the feed has been started on a length of chain, the spinning device is entirely automatic in its operation. By suitable cam movements the revolving rivet-spinning tools *A* are pushed forward and withdrawn after spinning each head, and while they are apart a feeding mechanism on the rear of the machine moves the chain forward and brings the next pin in position for spinning. The part *B* is a clamping rig which closes on the chain to hold it firmly in position during each spinning operation.

Fig. 49 is a rear view of a similar machine for a large size of truck chain. This chain will have cotter pins in one end of the pins so only one spinning head is belted up for operation and the other belt at *A* hangs loose.

Heavy truck chain is not made in long lengths, so to avoid the necessity of starting a fresh length every few minutes the connecting hooks shown at *B* are used to connect short lengths together and have them pass through the machine without any interference or trouble whatsoever.

All chains go through a rigid course of inspection before they are sent to the stock room. The two inspectors in Fig. 50 are inspecting bicycle chains. They take each length of chain and stretch it between two hooks, one end on the sprocket shaft at *A* and the other on a hook under the left hand of the furthest inspector. This man then pulls the lever in his right hand, which by suitable leverage stretches the chain and puts on it a pull sufficient to slightly raise the weight *B* from the floor. This insures detection of weak links and puts in the final degree of stretch.

When a chain reaches the inspectors, Fig. 51, it receives a thorough going-over from one end to the other. As it is pulled through the hands it must run over the fingers without showing any stiff joints, which when detected are at once limbered up or, if need be, replaced. The rollers are also tested to insure their easy turning on the pins.

FIGS. 50 AND 51. TESTING AND INSPECTING CHAIN
Fig. 50—Applying tension test load to bicycle chain. Fig. 51—Final inspection for flaws and stiff joints

Brass-Working Tools in a Railroad Shop

BY FRANK A. STANLEY

The tools here described in detail cover the special equipment used in a big railroad shop for making blow-off valves and their fittings. Complete, dimensioned drawings are included with halftone reproductions of the actual tools.

THE brass department of any railroad repair shop is apt to contain many features of interest to the visitor, and this is particularly the case with the one at the Southern Pacific Co.'s shops, Sacramento, Calif. The methods of handling various classes of valves, lubricators, feed cocks, nozzles, etc., will be illustrated in this article. It is the purpose to show particularly the details of the special-tool equipment for brass-working lathes and turret machines by means of which all classes of work under the one general heading are turned out with economy and rapidity.

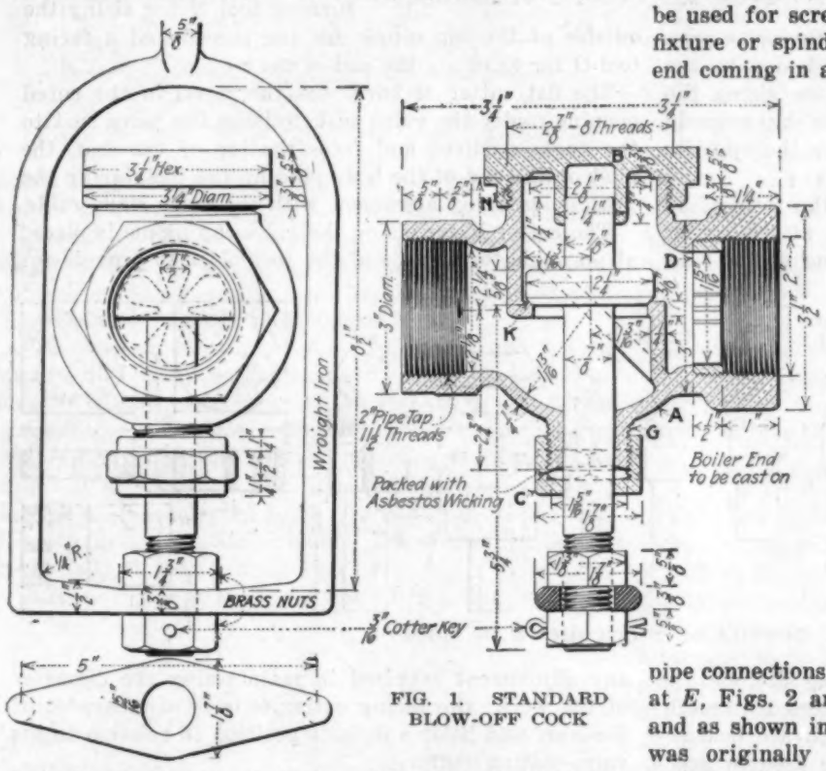


FIG. 1. STANDARD BLOW-OFF COCK

Blow-Off Cocks

In the illustrations a complete outfit of tools is shown for machining the various members of a standard blow-off cock, details of which are given in Fig. 1.

The valve body and its fittings will be seen in Fig. 2, where the body is shown at *A*, the valve-guide cap at *B*, the valve-stem packing nut at *C*, and the strainer at *D*. The other figures show tools for machining these parts. Details of all of these tools with dimensions are shown in Figs. 3 and 4, where all reference letters for designating individual tools are selected to correspond with the characters on the same tools shown grouped in Fig. 2.

Referring to Fig. 1 it will be seen that the parts are marked with the same reference letters as are used in Fig. 2 to identify corresponding members. The drawing of the valve shows it in its wrought-iron yoke, but all other parts, unless otherwise specified, are of brass.

Work of this character is held for first operations in special chuck jaws which enable the casting to be machined at one end so that further operations may be attended to with the work located and held by finished surfaces.

Where two ends of a valve body require machining and threading in line the work may be held on a swiveling chuck fixture or adapted to swivel on a faceplate knee to present one end after the other to the same kind of tools; or if preferred the end first finished may be used for screwing up and so locating on a faceplate fixture or spindle plug which will assure the opposite end coming in alignment when machined. The method of holding in the chuck after the first operation depends upon the quantity to be machined at a time, or upon the special requirements of the particular piece of work in hand. Blow-off cocks are here made in relatively large quantities, and the brass shop is consequently fitted up with a great variety of special chuck jaws, adapters and numerous special fixtures. With a job like this machined first on the face which receives the valve-guide cap *B* all other ends may be attended to by using the finished end for cap *B* as a locating medium for securing the work in a fixture on which it can be swiveled from one end to the other or placed in any required position with the simplest holding fixtures. The flat drill, or reamer, and the tap for the 2-in. pipe connections at the ends of the valve body are shown at *E*, Figs. 2 and 3. The reamer, as eventually made and as shown in Fig. 2, has been slightly modified. It was originally combined in one piece with the flat facing cutter, as clearly represented in Fig. 3. The form of the reamer as now used and as seen in Fig. 2 comprises a four-fluted tool carrying the facing cutter, which is inserted crosswise through the body. A similar arrangement is followed in the case of the reamer and facing cutter *F* used for the end of the valve which receives the strainer.

Both facing cutters in tools *E* and *F* have considerable working surface to cover, and by carrying the work of boring or reaming out the cored hole on a solid four-lipped tool and using an inserted facing blade, a much stiffer construction is secured and the upkeep of the tools is correspondingly simplified. Furthermore, the operation is smoother and less liable to result in chatter.

These tools, like the others that follow, are carried in the turret and the shanks are all made to a standard size for fitting directly in the turret holes or in adapters or holders.

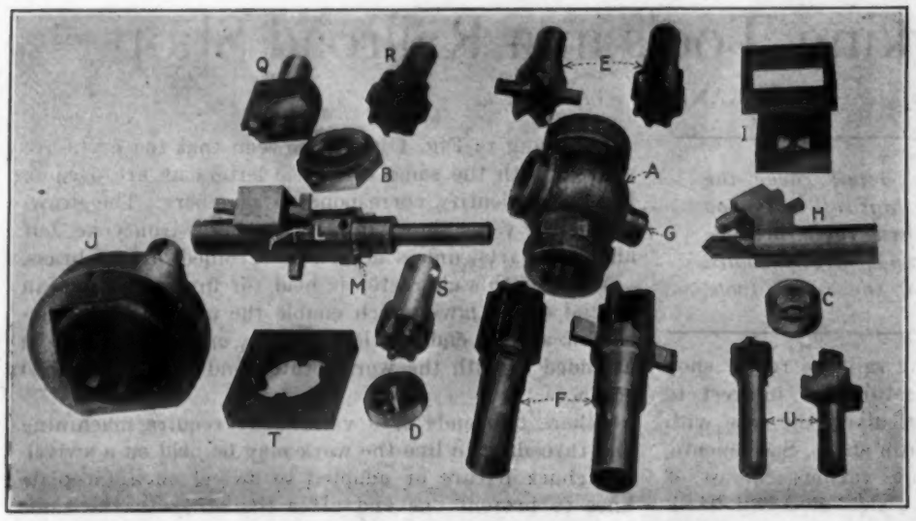


FIG. 2. SETS OF TOOLS FOR VALVES AND FITTINGS

Before the valve seat can be machined the valve-stem packing nipple *G*, Figs. 1 and 2, is finished with the tools *H*, Figs. 2 and 4, and a reamer for sizing the hole. This allows the valve-seat tool to be properly piloted when it is later put into use from the opposite side of the valve body.

The drilling and turning tool *H* is in the form of an open box or wing tool, carrying a drill at the center and two cutting tools in the angular wing at the side. These dies being for brass work are all made with narrow lands, ranging from $\frac{1}{4}$ in. for the $1\frac{7}{16}$-in. size to $\frac{3}{8}$ in. for the larger sizes. The lands are practically central as laid out, leaving the cutting edge half the thickness of the land ahead of the radial center line but with the cutting face finished to radial lines.

The tools for finishing the valve seat *K*, Fig. 1, are shown at *L*, Figs. 2 and 4. The tool body is formed with a pilot to enter the reamed hole in the valve-stem nipple and carries in addition to the angular face cutter *M* for the valve seat a turning tool *N* for sizing the outside of the cap nipple for the thread and a facing tool *O* for finishing the end of the nipple.

The flat cutter *M* bores out the metal in the cored opening under the valve seat, finishes the valve seat to the angle required and faces the top of the seat, the pilot on the end of the body guiding the tool during the process, assuring alignment with the valve stem guide.

The cutter *N* for sizing the valve-cap nipple is placed at an angle to the axis of the toolholder to provide for

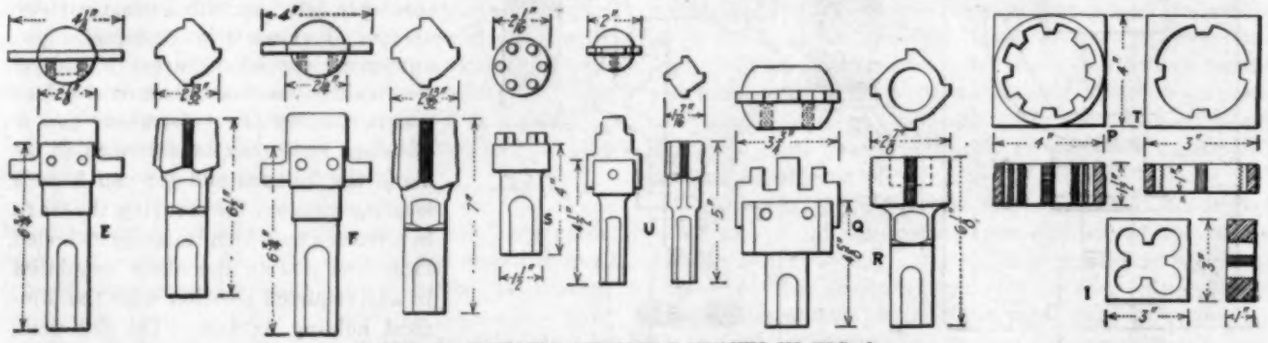


FIG. 3. DETAILS OF TOOLS SHOWN IN FIG. 2

The first tool turns the nipple to threading size, and the second rounds off the end. The two cutters are readily adjusted in respect to the drill and both are held securely by headless setscrews, which are used in practically all of the tools of similar type, giving a very neat and safe arrangement. The slots for the tools are cut out of the solid metal and the cutters are a close fit so that all parts are securely held when the setscrews are tightened.

Threading Dies

The dies for threading the various portions of the valve are of square outline and used in a square-pocketed holder into which they are readily slipped as required.

The threading die for the nipple above referred to is seen at *I*, Figs. 2 and 3, and the holder at *J*, Fig. 2, only. As the outside of the die is only 3 in. square, while the holder socket is large enough to receive the 4-in. dies required for other threading operations on the valve, a square ring adapter is provided as shown at the rear of die *I* in Fig. 2 only.

any adjustment required in maintaining the diameter of the work; the facing cutter *O* is fixed crosswise of the body and holds a definite position in relation to the valve-seating cutter.

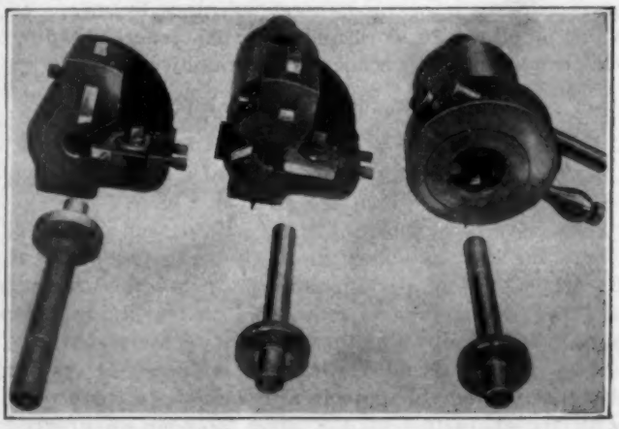


FIG. 5. TOOLS FOR TURNING VALVE STEMS

The die for cutting the 2¾-in. thread on the valve for the guide cap is shown at *P*, Fig. 3, and in Fig. 2, in place in its holder *J*.

The valve-guide cap *B*, Fig. 1, has a central blind chamber formed in the projecting boss on the inner face. This is the opening that guides the valve spindle on that side of the seat.

This brass casting is machined with the tools in Figs. 2 and 3, where *Q* is the flat cutter for reaming out the hole and for turning the bore for the thread and for facing the bottom of the cap. The flat cutter *Q* is of high-speed steel. It is of peculiar contour to finish the surfaces as required and to clear the metal where no

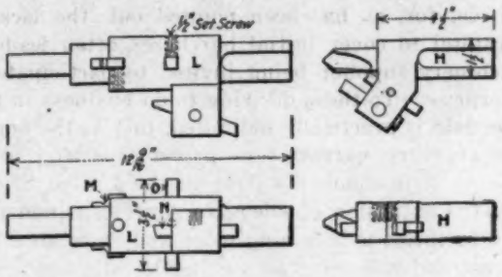


FIG. 4. BOX TOOLS AND VALVE-SEAT TOOLS

finish is necessary. It bores out the shell of the cap and is followed by the tap *R*. This tap is in the form of a shell at the end to provide a clearance chamber which enables the tap to be run down over the projecting hub in the cap and so reach the shallow wall around the outside which has to be tapped.

The strainer seen in place at *D*, Figs. 1 and 2, is a narrow disk cored with six openings and threaded externally to fit the bottom of the tapped connection which is made for 2-in. pipe. The device made for holding this in the lathe while it is turned and threaded is shown at *S*, Figs. 2 and 3. It is a short arbor with six pins in its face adapted to receive the thin casting and drive it for the machining cuts. The die, which is run on while it is thus held, is at *T*, Fig. 3.

There is in the group Fig. 2 one other fitting that may

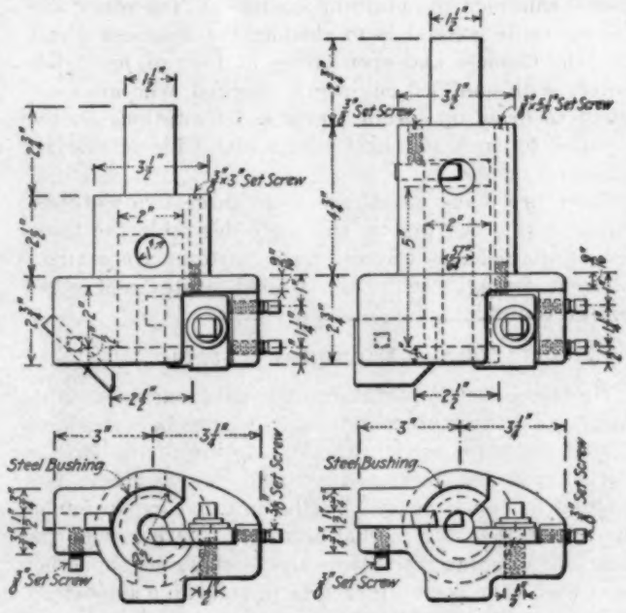


FIG. 6. DETAILS OF BOX TOOLS

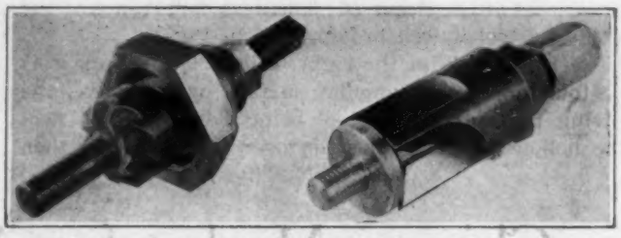


FIG. 7. REAMER AND FACING TOOL FOR REPAIRING VALVES

be referred to as the valve-stem packing nut *C*. The tools for boring and tapping are represented at *U*, Figs. 2 and 3. They require little description. The single flat cutter performs the service of boring out the hole and chamber in the nut and facing it at one time.

The valve stems, which are cast in the form shown in Fig. 5, are finished with the tools at the top of the group and shown with their dimensions in Fig. 6. Both box tools are made with cast-iron bodies and have cutting tools back and front.

The first operation tool to the left, Fig. 5, is for the short end of the stem, the work being chucked by the long end for this process. The inverted tool is placed at an angle to allow for adjustment in turning the valve diameter, and the flat, broad-faced cutter is adjustable by means of two screws to hold the guide end of the stem to size. This cutter also faces the side of the valve disk and finishes the end of the spindle.

The work is then reversed and the long spindle turned. The box tool for this has two flat cutters for sizing the stem and finishing the other face of the disk, and at the rear of the body is inserted a square tool for squaring off the end of the work to length and preparing it for threading by the opening die.

Hand Tools for Finishing and Repairs

The tools in Figs. 7 and 8 are for repairing the valve seats and valves when worn. The seating-tool spindle *A* carries two cutters as required, one *B*, for facing off the flat surface surrounding the valve seat, the other, *C*, for operating in the valve seat itself. They are threaded internally to fit the thread on the spindle and seat up against the shoulder behind the thread. The spindle fits in the threaded sleeve *D*, which in turn fits the nut *E*, and when the appliance is assembled and put into place the nut *E* is screwed onto the job in place of the regular guide cap and allows the cutting tool to be adjusted to the work by operation of the squared pro-

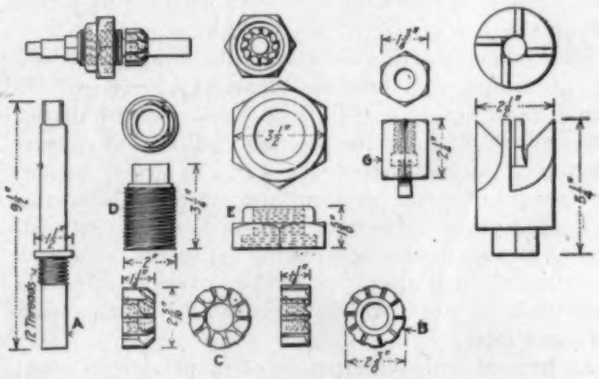


FIG. 8. DETAILS OF REAMER AND FORMING TOOL

jecting end of the sleeve *D*. The neat appearance of the assembled tool is well brought out in Fig. 7.

The hollow mill at the right in both Figs. 7 and 8 is for touching up the angular surface on the valve, the cutting portions of the tool being beveled to 45 deg. The hollow mill is slipped on over the stem and then the backing up device *G* is screwed on behind the mill. This carries a setscrew which enables the operator to readily adjust the tool to the cut by simply setting up the screw and so forcing the mill forward or drawing back the work, which to all purposes amounts to the same thing.

Chinese Market for American Machinery

THE machinery situation in China, according to the Department of Commerce, is more a question of supply than of demand. Emerging from internal discussions, economically rejuvenated compared with the destruction of wealth going on in Europe, China has found the usual sources of supply practically closed by the war. With silver worth more than ever known, the people would be anxious to buy were not the same low exchange price in gold for their exports a deterrent. Everywhere abroad the home markets are being considered first, and if ships are found for what is left they are carefully parceled out. The result has been the industrial awakening of China and a determined effort to supply these needs at home, with the consequent expansion of Chinese domestic industries.

The necessity that has driven the Chinese to look to home manufactures has been the mother of invention in more lines than one, and hardly any field has been left untried. Among the ventures noted during 1917 are pumping, mining and printing concerns, flour and rice mills, cotton-weaving and silk filatures, oil and paper mills, brick and cement works, candle and soap factories, glassware and porcelain establishments, electric-lighting and water works, chemical manufactories, sugar refineries, and factories for making surgical instruments, heating apparatus, electric-light bulbs, bicycles, imitation Panama hats, motors, printing presses, needles and nails, clocks, tiles, carpets, canvas and leather ware. Many other factories have been started in a small way and in every case there is the primary need of machinery.

New Chinese Enterprises Chiefly Coöperative

Due to the lack of capital the majority of Chinese enterprises are of a joint nature, the Chinese supplying the working capital and foreign interests supplying the fixed capital in the form of machinery and supplies. In a great many instances original installations have been made at a loss with a view to getting the profits out of the venture from accessories, repairs and renewals, as well as from an advertising standpoint, with the advantage of subsequent business elsewhere. As a rule, the Chinese wish to pay for a new installation out of the profits, and the dominant position of German machinery in China before the war was largely because they always took part payment and extended the balance over a few years. Moreover German firms carried small boilers, steam engines, ice-making apparatus, hand flour and rice mill machinery, oil engines, dynamos and machine tools in stock, which were installed and payment arranged later.

At present only enterprises of a private or semi-public nature will be dealt with, reserving the strictly governmental undertakings, such as railways, arsenals, mints, etc., for another survey. The sale of machinery depends largely on the mode of financing such private enterprises, for, as has been pointed out, the lack of ready capital to cover initial purchases often leads to the machinery supplier being invited to participate in the enterprise. To those desiring to do business in this way, the field is practically unlimited, just as the opportunities are very narrow for anyone expecting to do business as it is commonly done in the United States. Happily the extension of adequate American industrial banking facilities is becoming more and more an established fact and will serve as a valuable intermediary to those not desiring actual participation in the enterprises.

Two Methods of Securing Contracts

There are two well-recognized methods of obtaining machinery contracts in China. The first is that of appointing one of the large mercantile houses having branches in all important Chinese trade centers as general agents on a fixed agreement for a term of years. This system was employed by almost all the large German manufacturers, and its principal advantage lay in the benefits accruing from an old-established connection on the ground with valuable Chinese connections. (A list of such agencies is on file at the bureau's district offices for use of interested parties.) In addition it has been found advisable to send one or more qualified engineers trained at the home factory, who could use the offices and staff of the agents' branches in China on their trips of inspection and coöperate with the agents' salesmen in obtaining business. The other and less desirable method is to conduct the business direct with the Chinese and open offices at four or five trade centers with qualified engineers attached, who are competent to draw up specifications and quotations on the spot and to carry on negotiations with Chinese officials and purchasers.

There are many variations from these two methods, but as a rule the first is the more desirable for those new to the field, as Chinese trade customs are entirely different from those in the United States and other foreign countries.

Textile-Machinery Imports

The decreased importation of textile machinery during the past three years in no way denotes backwardness in that industry, as the practical closing of the British market and the increased demand for Japanese machinery in Japan caused by the unusual expansion of the textile industry in that country, together with the lack of shipping facilities and embargoes in other countries, have been big factors in retarding imports.

The importance of this business cannot be estimated

from past results. In 1917 there were 56 spinning companies in China, and their combined output has only decreased the importation of cotton goods from 32 per cent. of the total imports in 1915 to 27 per cent. in 1917. This shows that the demand for this class of manufactures is growing, and it is safe to assume that the development of the Chinese industries engaged in this business will be coextensive.

In respect to boilers, turbines and other propelling machinery, the decrease in imports has been practically due to inability to get the goods.

The promising field for American agricultural machinery at present should be China. Just as American machinery was being introduced into this market in 1916 it was necessary to curtail production and a good part of the business went to Japan in 1917. The absence of turmoil at this moment is very favorable to the introduction of agricultural machinery. With fewer bands of brigands depredating the country the farmer is more apt to invest in permanent improvements, and with the exception of certain flooded districts the rural population is better able to afford such expenditures, as their products are bringing high prices and machinery bought at gold rates is relatively cheap.

Unclassified machinery showed the largest gains, proving that new industries have opened up during the past three years for which no custom classifications have yet been prepared. In general these machines correspond with the list of new industries already noted.

The trade in machine tools has increased almost 200 per cent. since 1916. Japan's share has increased 300 per cent., that country taking not only its own share but practically all of that of Great Britain and France. The following are the values of the imports of machine tools into China during 1915, 1916 and 1917 (the value of the Haikwan tael in United States currency was $0.62 in 1915; $0.79 in 1916 and $1.03 in 1917):

Imports from	1915 Haikwan Taels	1916 Haikwan Taels	1917 Haikwan Taels
Japan	42,094	49,740	160,475
United States	15,494	23,133	39,619
Hongkong	414	2,600	4,189
Canada	.....	270	1,364
Great Britain	9,052	10,772	1,254
All other countries	5,757	11,263	1,493
Total imports	72,811	97,778	208,394
Reexports	2,629	35,105	32,587
Net imports	70,182	62,573	175,807

One of the evidences of increased purchasing power owing to the rise in the price of silver has been the increased demand for sewing, embroidering and knitting machines. Many small businesses have thereby been instituted to supply the local demand. The trade that Great Britain formerly held has been taken over almost entirely by the United States.

Under electrical materials and fittings are included all accessories and appliances of an electrical nature. The use of these appliances is naturally limited to those cities and districts where electric power is obtainable, and the constant growth of this trade is promising. A great many electric power plants have been unable to get machinery during the past year to take care of natural increase in consumption and new contracts for current have been subsequently refused. With an increased import of appliances we can only infer to what size the business would have grown under normal conditions.

As has been probably noted from the figures in the different kinds of machinery, Japan has taken a more and more dominant position in China's machinery trade each year. This is more readily seen from the totals of all classes of machinery imported, including machine tools, sewing machines and electrical equipment by countries as given in the following table:

Imports from	1915 Haikwan Taels	1916 Haikwan Taels	1917 Haikwan Taels	Percentage of Increase (+) or Decrease (—)
Japan	1,720,189	3,721,456	5,043,924	(+) 193
United States	1,042,134	1,656,567	2,236,313	(+) 114
Great Britain	2,451,056	3,175,198	2,056,756	(—) 2
Hongkong	810,126	1,211,708	674,384	(—) 2
Canada	56,605	299,511	427,025	(+) 673
All other countries	977,988	159,730	490,097	(—) 51
Total gross imports	7,068,098	10,224,170	10,918,499	(+) 54
Reexports	210,107	408,396	1,019,571	
Net imports	6,857,991	9,815,774	9,898,928	(+) 44

These figures show a consistent demand for industrial machinery and equipment in China. Although Japan has increased its sales to a greater degree than we have, on the contrary this increase has been mainly in electrical fittings and equipment, supplies which China is rapidly making at home. The growth of Canada's trade in other classes has offset the losses of Great Britain, and Canada is likely to become a serious competitor in the heavier lines. There should be nothing to prevent the United States not only from holding the advantage obtained, but with increased supplies at home after the war, we should obtain a greater share of China's machinery business.

Latin-American Demand for American Steel

Latin-American concerns wishing to specify American structural steel for building and railway purposes can now do so without difficulty by referring to pamphlets in Spanish and English just issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce. These pamphlets are intended to facilitate sales of this material in Latin countries, and are published in response to numerous requests from these countries.

The text defines with scientific accuracy the accepted American standards as adopted by the American Society for Testing Materials, and the publication of the series has been made possible by the coöperation of the American Society of Civil Engineers and the Bureau of Standards and the Bureau of Foreign and Domestic Commerce of the Department of Commerce.

The pamphlets thus far announced are "Standard Specifications for Structural Steel for Buildings," Industrial Standards No. 8; "Standard Specifications for Structural Steel for Locomotives," Industrial Standards No. 9; "Standard Specifications for Carbon Steel Bars for Railway Springs," Industrial Standards No. 10; "Standard Specifications for Quenched and Tempered Carbon-Steel Axles, Shafts and Other Forgings for Locomotives and Cars," Industrial Standards No. 12, and "Standard Specifications for Carbon-Steel Forgings for Locomotives," Industrial Standards No. 13. These can be purchased at 5c. a copy from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from any of the district or coöperative offices of the Bureau of Foreign and Domestic Commerce. Other numbers of the series will follow.

The Industrial Progress of Canada

The Guaranty Trust Company of New York here outlines the changes wrought by the war in the financial and industrial structure of Canada and the methods being adopted in that country to increase its economic advantages, particularly the development of foreign trade.

TO CANADA the war has meant self-realization. In response to the needs of her allies customary activities have been intensified and enlarged. New undertakings have been promoted. From coast to coast the spirit of enterprise has been stimulated, until now, after nearly four years of war, she stands forth fully cognizant of all the inferences to be drawn from her remarkable achievements in finance and industry.

That she should provide generously from her vast stores of food and raw materials for the sustenance of the mother country was to be expected. That her hardy sons should be found in the forward ranks of liberty's champions was in keeping with the traditions of the race from which they sprang. But that a meager population still largely in the agricultural stage of economic development should be able to lend more than $760,000,000 to the government, in spite of rising prices and heavier taxes; to take war orders aggregating nearly two billion dollars, and to expand foreign trade by more than one billion dollars, was certainly beyond the calculation of the most sanguine believer in Canadian resourcefulness.

Significance for the Future

If anything has been more surprising than the bountifulness of Canada's response to the urgings of patriotism it is the readiness with which her people have grasped its significance for the future. Here is a country that has crowded into a few years an experience usually timed by decades and generations. Under ordinary circumstances the transition from agriculture to industrialism, from the subjugation of nature to the thorough development of her resources, from separation to nationalism, from colonialism to internationalism, is a matter of steady growth, of conscious striving along carefully drawn lines, or of an accommodation to circumstances enforced by the irresistible working of economic laws. The most enthusiastic Canadian does not maintain that anything like a complete transformation has taken place in the economic life of his country, but it is submitted that the necessities of the world struggle have forced changes in the relative importance of various activities, and that if the suggestions therein contained are judiciously availed of and the actual accomplishments sustained and broadened, Canada will move forward to a new and unassailable position among the manufacturing and trading nations of the world.

Canada has hardly come yet to consider the period after the war as a distinct and separate problem, capable of visualization apart from present conditions and activities. Lacking the experience of Great Britain or Germany in such matters she is incapable of the nice discriminations that in those countries have resulted in the creation and adjustment of elaborate machinery to fit each possible phase of the economic situation which their respective leaders believe will arise. Nor is she merely blundering into the future, but in her case the things she feels she must do now and the things she feels she may do hereafter are so interwoven and the absorption of her energies is so great that for the most part programs give way to performances and the country grows into economic power before creating the formulas for attaining it. Her hopes for the future are measured by the disproportion between what she has done and what it was thought she was capable of doing less than four years ago. Canada's record is a summary of her promise.

Financial Achievements

Standing out instructively in this record is the financial achievement of 7,000,000 people, various in nationality, scattered over a territory of nearly 4,000,000 square miles. It is the more noteworthy in view of the effect of the declaration of war by the United States. Before that declaration there was a very restricted market for Dominion government bonds in Canada, and municipals sold better in England and the United States than at home, so that every year Canada paid out not less than $125,000,000 to British and $50,000,000 to American investors for interest charges. In the first year of the war a bond issue of even $50,000,000 would have been regarded as an impossibility except for the existence of surplus funds in this country. With the aid of American investors a loan of $100,000,000 was actually floated in 1915, and another of similar amount was floated a year later. In March, 1917, before the United States entered the war, and when it appeared possible she would not do so, a third war loan totalling $150,000,000 was determined upon. Each of these loans was issued below par and with interest at 5 per cent. Now most financial observers saw that a declaration of war by the United States would mean loans and heavy taxation and undoubted curtailment of the market here for foreign securities. Exactly that happened, and yet in November, 1917, the Canadian people subscribed for $418,000,000 of the Victory Loan issued at 100. Meanwhile loans totaling more than $198,000,000 had been made from Great Britain and the United States, and War Savings certificates to the amount of $12,000,000 had been disposed of. In other words the patriotic fervor of Canada was equal to an aggravated demand, and without thinking of it in that way her people suddenly discovered themselves financially competent.

That the net debt of the country has increased from $335,996,850 in March, 1914, to $1,010,780,470 in March, 1918, is no small matter, but that 75 per cent. of this indebtedness represents the savings of men and women who believe in Canada's ability to pay is in the case of a country that hesitated at a $50,000,000 loan at the beginning of the war an indication of reserve strength that overshadows every liability.

The increase of Canadian manufactures has been amazing. The output of steel products has more than doubled since the war began, despite the shortage of

raw materials, labor and transportation facilities. A large part of the output has consisted of munitions, but progress has been made in other directions, notably in the production of agricultural machinery and tools. Along with the manufacturing has grown the shipbuilding industry, and in looking forward to future possibilities the Canadian has combined the two as mutually dependent and contributive to the upbuilding of foreign trade. At the very outset he has been apprised of certain difficulties in the way of developing them. In the case of the steel industry there are comparatively few places which afford easy access to markets and at the same time permit an economical assemblage in quantity of such necessary materials as coal, ore, and limestone, and such places as there are have already been taken. In the case of shipbuilding there are inadequate facilities and lack of experience in the machine shops from which marine engines are produced, and materials are expensive. Heretofore Canada has produced no steel plates, and shipbuilders must pay $85 per ton for them as against $65 paid by the United States Emergency Fleet Corporation in this country and $80 a ton paid in England.

Solving Steel and Shipbuilding Problems

To solve both problems at once it has been decided first to extend and modernize the existing steel plants which do have the necessary economic advantages. This done the variety of products is to be enlarged and, whereas steel rails have heretofore been manufactured mostly, hereafter plates will be rolled and other commercial shapes now imported from the United States will be turned out. Attention is already being given also to the small industries in Quebec and Ontario which produce tool steels, crucible steel and alloys. As for meeting shipbuilding requirements there has been a great increase in the number of machine shops of all kinds and for four years there has been going forward a transformation of labor that means eventually a sufficient number of trained machinists.

In 1874 there were produced in Canada 190,756 tons of ships, but that was when the wooden vessel held sway. In 1914 Canadian production had fallen to 43,346 tons. Since Mar. 1, 1917, contracts totaling $64,500,000 have been let for the construction of ships in Canadian yards. Fourteen yards are at work on steel ships, mostly for the Imperial Munitions Board. The money for these ships is being advanced by the Dominion and it is a matter of pride in Canada that for the first time large vessels are being built in Canada with Canadian money and for the Canadian government. When the yards have finished with the ships for the Imperial Munitions Board they are to continue building under new government contracts amounting, according to present plans, to from $30,000,000 to $50,000,000 a year. These latter ships are not for the account of the Imperial Munitions Board, but will probably come under control of the Minister of Marine and Fisheries.

Returning again to the steel business and its connection with the shipbuilding program it is interesting to note that the Minister of Marine and Fisheries has made an agreement with the Dominion Iron and Steel Corporation under which the plant of that company at Sydney Harbor will be extended at a cost of from $3,000,000 to $5,000,000 to provide for the manufacture of 150,000 tons of ship plates a year. The government will not contribute to the cost of plant extension, but will take 50,000 tons of the product each year for five years. It is significant that Canada enters upon such a program despite the certainty that Great Britain, the United States, Germany, France and Italy, to say nothing of Japan, will make extraordinary efforts to produce ships in great numbers and will probably be able to do so much more cheaply than Canada. Her decision in this matter rests upon the belief that for years to come the need for ships will be continuous and that the high prices to be offered for freighters justifies the investment and the effort she is now making.

World Trade

Canada is much in the position of many other countries which never realized the value of their natural resources until a world-wide shortage of raw materials and manufactured articles brought them into international trade, created new commercial routes to their very shores and inspired them with golden visions of the future. In the fiscal year just ended Canada's exports of domestic and foreign merchandise were valued at $1,586,169,792 and her imports at $962,521,847. The total of her foreign trade has more than doubled in the last two years. In 1914 Canadian exports to the United States were valued at $200,459,375 and imports from the United States were valued at $200,786,091; in 1917 the exports to the United States had reached a value of $486,870,690 and imports from the United States a value of $677,631,616. In the hope of retaining just as large a share of this newly acquired business as foresight, energy and adjustability can make possible, Canada desires not only to enlarge and improve enterprises upon which she has recently embarked, but also to develop more efficiently certain natural advantages which war conditions and the prospect of an extended period of competition have emphasized. Various organizations are being formed to work out suitable plans in the numerous instances where Canadians have neglected opportunities in the past.

Fish to Be a Greater Source of National Wealth

An obvious instance and of particular interest to the United States is the fish industry. One-fourth of the world's supply of fish is produced from the waters of the United States and Canada. The value of the Canadian yearly catch is $40,000,000 as compared with $150,000,000 for the United States, $52,000,000 for Great Britain, $50,000,000 for Japan, $50,000,000 for Russia and $33,000,000 for France. Germany's annual production is valued at $12,000,000 and that of Norway, Sweden and Denmark, at $25,000,000. The Canadian yearly catch before the war was 112½ lb. a person, of which only 29 lb. a person was consumed by the Canadians, while 83½ lb. a person was exported, chiefly to Great Britain and the United States. In Great Britain the consumption was 59 lb. a person a year. Since the war began there has been an increase in the demand both in this country and Great Britain, and Canada is awakening to the possibilities of wealth in her unlimited supplies. The suggestion is made that the government turn to the Canadian fisheries as a debt-paying source, and under the direction of a Dominion Fish Committee plans are being made to exploit both the

Atlantic and Pacific coasts and the lakes in Alberta, Saskatchewan and Manitoba. New methods of fishing are being promoted to the end that cargo space be fully utilized by taking in all varieties rather than by limiting the catch to the higher priced fish.

Exploitation of Canada's timber resources is also contemplated. Great Britain uses 650,000,000 cu.ft. of lumber annually and will use a great deal more in carrying out her building program after the war. Heretofore 65 per cent. of this supply has come from Russia, Norway and Sweden because freight rates from Baltic ports are less than one-half those from Canada and the United States. Labor costs are also lower, and the result is that Australia, New Zealand and South Africa also have bought largely from northern Europe. Nothing definite has been accomplished yet, but the lumber merchants in both eastern Canada and British Columbia are hoping that somewhere in the reconstruction program which is being framed for the British Empire provision will be made to offset the factors in lumber marketing that have militated against Canada.

Other Resources of Wealth

These examples are sufficient to show that Canada is fully aware of the necessity of employing every resource of wealth in order to hold her place in world trade. Further to encourage the country to that restriction of imports and that excess of production upon which success in foreign trade depends, new methods of production and distribution are being devised. The Canadian Wool Growers' Association is developing a scheme to bring the various provinces into coöperation in the selling and marketing of wool. An organization limited to sheep breeders and agriculturists has received both Dominion and provincial incorporation with powers that mean ultimate control of the business and privileges to the directors that indicate the permanency of the arrangement.

Organizing Industries

In the manufacturing field the Export Association of Canada is working with the Dominion government to formulate plans for the development of the country's natural resources, their conversion into finished products and their sale in world markets. The Canadian Mining Institute is on record as favoring a national organization of all technical and industrial bodies to prepare for after-the-war problems. The institute favors two organizations within each industry, one to encourage production and the other to secure trade. There is significance in the suggestion that employers and employees in equal numbers ought to be appointed to the production boards, whose duties will be to accelerate output, improve educational facilities and to classify, value and certify labor.

Reconstruction

The Canadian Industrial Reconstruction Association is now being organized. Its object is to maintain industrial stability and to consider reconstruction problems as a whole. It will investigate industrial conditions, labor prices, market possibilities and transportation facilities. Under the general head of reconstruction the association will inquire into the condition of technical and general education, land settlement, coöperation among rural producers, rural conditions, differences between capital and labor and the welfare of women in industry.

The Canadian National Reconstruction Groups is still another organization formed for the purpose of studying the problems which will arise after the war. It will deal with business readjustments, unemployment, social well-being, capital and labor, the returned soldier, immigration, development of natural resources and other industrial and economic questions. The effort to bring home to everybody the importance of the questions involved is thus described in the prospectus of the organization:

"It is proposed to form a large number of groups in all parts of Canada, each consisting preferably of some 10 to 15 persons of either sex, and representing as far as possible, different phases of agricultural, industrial, commercial or professional activity and different shades of opinion, for the purposes of studying and investigating in detail the many important subjects which the changed conditions at the close of the war will bring into the field of urgent practical politics, especially the ominous possibilities of widespread unemployment. In populous centers, several such groups may well be formed. It is particularly desirable that in these groups, there should be representatives of the returned soldier, organized labor and the producer.

The Department of Soldiers' Civil Reëstablishment has already done a great deal for those who have returned maimed, blinded or in poor physical condition from the battlefield. These men are being nursed back to health and self-confidence whenever that is possible. They are being trained in new industries or arts so that they can again earn their own living. Thousands of them will be sent to farms. Throughout Canada there is a feeling on the part of those who have stayed at home that where his condition permits the returned soldier should have back the work he left to fight for his country and that where it does not permit he should be treated with every consideration until he finds his way back to health and personal independence.

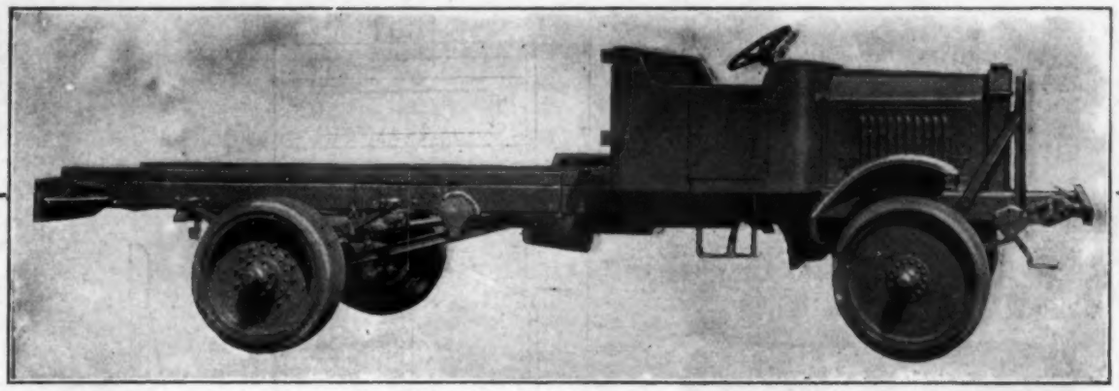
"Draftsman or Engineer?"

By M. E. Duggan

In a very interesting article on page 907 of the *American Machinist* G. J. White says: "No man should have charge of designing work unless he has spent a certain length of time in the drafting room."

Why stop at the drafting room? Why not include the foundry, pattern shop and machine shop? Drawings of machine parts sent to these departments are very often so designed that it is almost impossible, or at best impractical, to mold or to machine them.

If the design of a machine part or the way in which the pattern is constructed causes trouble for the molder, or because the job is a complicated one the molder does not understand it, why send the designer to the foundry to instruct the molder? The designer should be acquainted with molding as well as pattern making, and his designs would then be made in accordance with recognized foundry practice. A coat hook, a linen duster and an occasional visit to the pattern shop, foundry and machine shop are important factors in the making of a practical designer out of a good draftsman.



Building Trucks for the Aviation Service—II

By M. E. HOAG

A continuation of the article describing some of the special parts that are used upon motor trucks built for the Army and Aviation service, with details of their construction and assembly.

ON ACCOUNT of the severe work sometimes required of army trucks particular construction is necessary in a number of parts to withstand shock and strain not met with in ordinary commercial work.

Special heavy bumpers are required on both the front and rear of the trucks, the front ones being in the form of two heavy coiled springs back of a steel bar of special shape. The rear bumper is of solid wood bolted to and supported by the two cast-steel brackets shown in Fig. 8 and drawing Fig. 9, which gives the details. Only a small amount of machining is required on these pieces which are first disk-ground on the large, flat surface, and then milled with an inserted tooth cutter, as indicated in the drawing, after which the bolt holes are drilled. The application of these brackets and the wooden bumper is shown in the headpiece of this article.

The rear-spring seat shown in Fig. 10 and drawing Fig. 11 requires a number of machining operations, some of which are held to rather close limits. The sur-

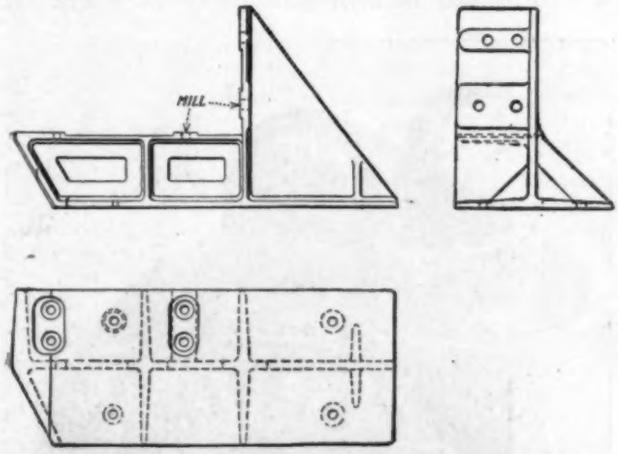


FIG. 9. DETAIL OF REAR-BUMPER BRACKET

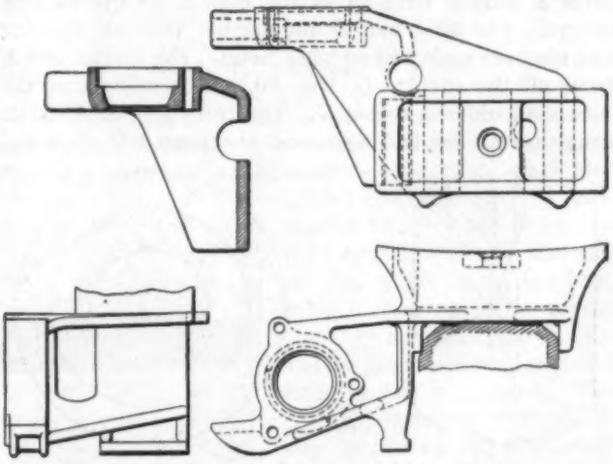


FIG. 11. DETAIL OF REAR-SPRING SEAT

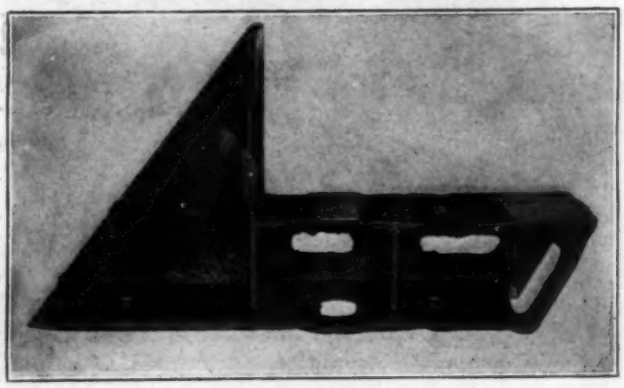


FIG. 8. REAR-BUMPER BRACKET

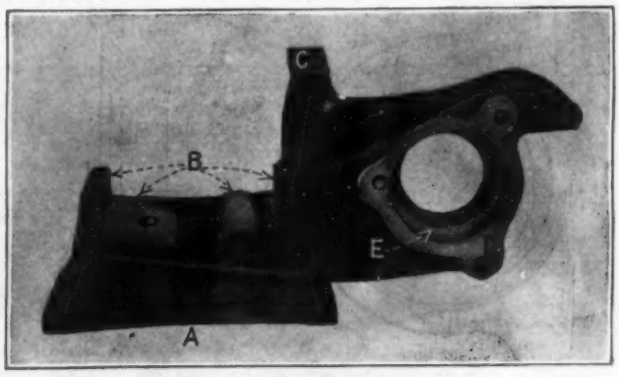


FIG. 10. REAR-SPRING SEAT

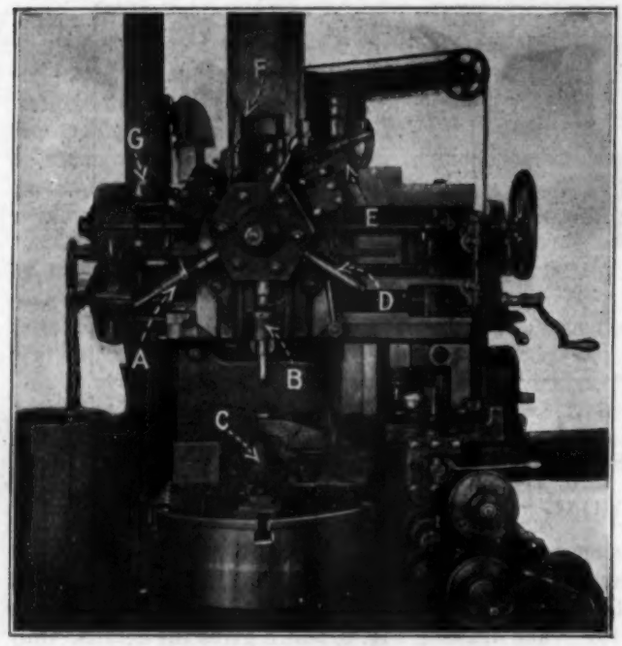
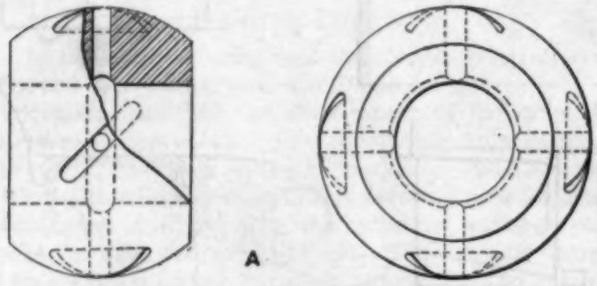


FIG. 12. MACHINING REAR-SPRING SEAT

face at *A*, Fig. 10, is first disk-ground and then the surfaces at *B* are finished with an inserted tooth cutter on the milling machine; the surface *C* is also milled and the piece is then finished at the ball opening *E* on a boring mill. For this a simple holding fixture is used, Fig. 12, and six tools operate on the piece. Two of these tools, *A* and *B*, have hardened and ground pilots which enter a ground bushing in the boss *C* of the holding fixture. The first tool *D* roughs out the ball opening and removes scale and surplus metal. The second tool *E* faces off the surface *D*, Fig. 10, and partly forms the square-shouldered recess *E*. The third tool *F*, Fig. 12, rough-forms the ball seat, and the fourth *G* chamfers



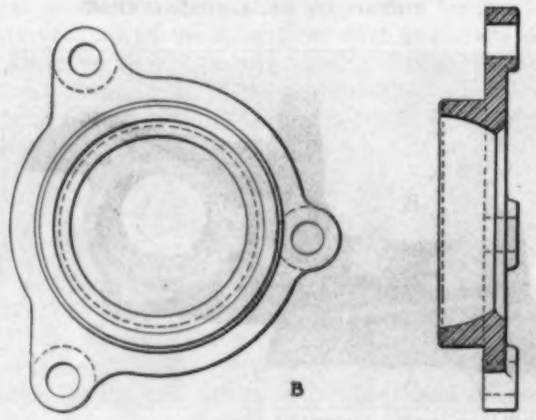


FIG. 13. RADIUS-ROD BALL AND CAP

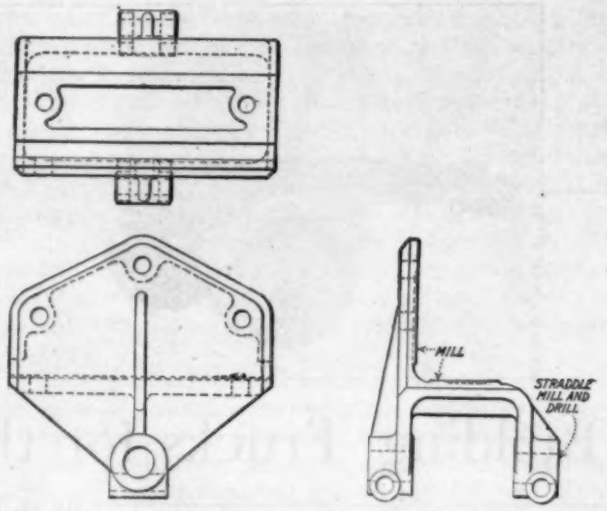


FIG. 14. FRONT-SPRING BRACKET

the under edge of the opening. The pilot tool *A* has a double-ended sweep which forms the square-shouldered opening to depth and diameter. The sixth tool *B* is a formed cutter which finishes the ball seat. This completes the operations on these pieces except the drilling of the bolt holes. The radius rod ball *A*, Fig. 13, which goes with this spring seat is purchased outside. It is of mild steel, casehardened and ground. The ball cap *B* is machined in the shop, but is so simple that no description is required.

The front-spring bracket shown in Fig. 14 is milled at the surfaces indicated on the drawing, with an inserted tooth cutter and the holding fixture shown in Fig. 15.

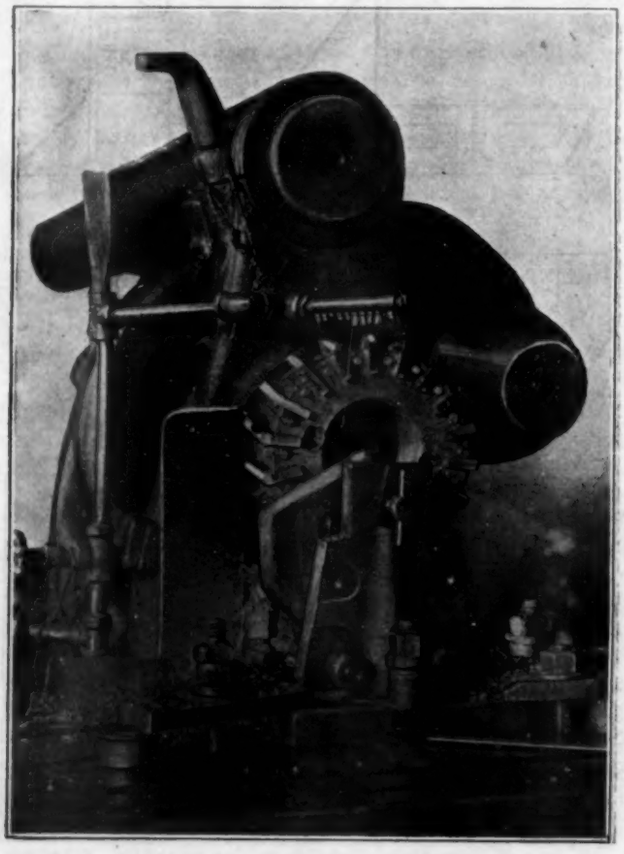


FIG. 15. MILLING FRONT-SPRING BRACKETS

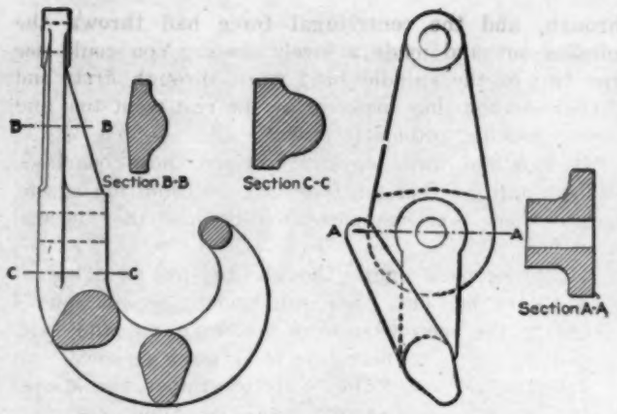


FIG. 16. DETAIL OF TOWING HOOK

The two bosses are then milled, the pin holes drilled and reamed, and the bolt holes drilled in simple drilling fixtures.

The towing hooks shown in Fig. 16 are drop-forgings and require no machining operations aside from drilling and spot-facing, but they are a very important part of the equipment, where shell holes and muddy roads have to be negotiated under heavy loads and trucks pulled out of the mire.

The drawbar and pintle shown in Fig. 17 is an interesting piece of equipment, but does not involve any intricate machining operations. The pintle *A* and pintle latch *B* are identical with those used on Government gun carriages and vehicles. These parts are received as drop-forgings and are machined in the shops, a milling and drilling operation being all that is required on the pintle latch.

The forging of this piece is the most difficult part of its making. Some of the Government arsenals forge this piece in halves, which are then welded together by electric process; but some outside shops forge it flat and it is then passed through a bending die which folds the sides or wings. The greatest difficulty experienced in this method of forging is in securing sufficient stock to fill the corners. The drawbar-spring seat illustrated in Fig. 18 is made from round mild-steel bar stock, the pieces being first sawed off to length and rough-drilled, after which they are finished in Potter & Johnson automatic two set-ups being required. On the first set-up the hole is bored and reamed

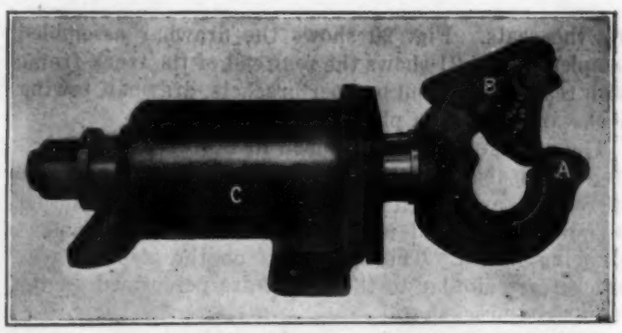


FIG. 17. DRAWBAR, HOUSING AND PINTLE

and the long end turned and finished; on the second setup the short end is finished.

The drawbar proper, or pintle, shown in Fig. 19 is a heat-treated drop-forging requiring several operations

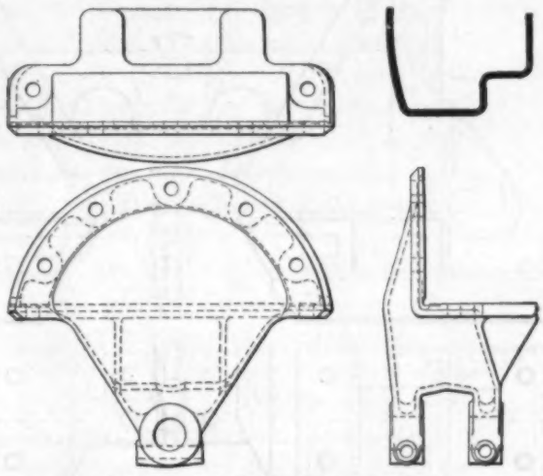
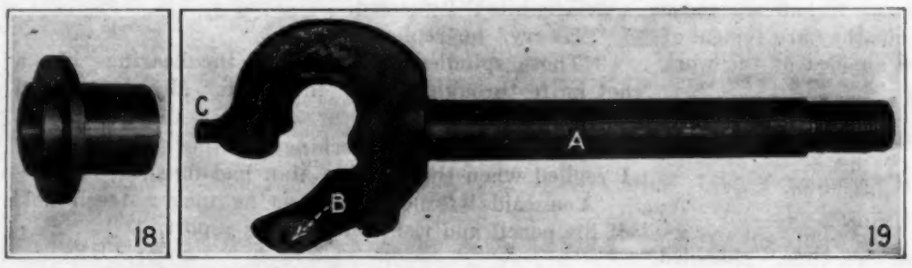


FIG. 22. RADIUS-ROD BRACKET

—centering, turning the shaft *A*, and the threaded end, which is necked and turned to size, but not threaded. The bosses *B* are straddle-milled, and the spring slot drilled and slotted in the milling machine. The pin hole in *B* is drilled, and then the end of the shaft threaded and drilled, after which the center lug *C* is cut off. The spring slot is peened down after the latch spring is inserted. The spring housing *C*, Fig. 17, is a cored casting and is finished by surfacing the base and boring the openings and fac-



FIGS. 18 AND 19. DRAWBAR SPRING SEAT AND DRAWBAR HOOK

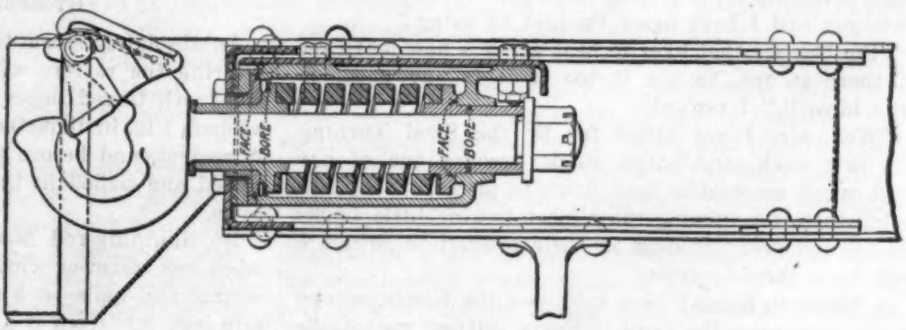


FIG. 20. DETAILS OF DRAWBAR ASSEMBLY

ing the seats. Fig. 20 shows the drawbar assembled complete. Fig. 21 shows the rear end of the truck frame with rear bumper and bumper brackets, drawbar, towing hooks and braces in place.

The radius-rod bracket shown in Fig. 22 is somewhat similar in shape to the front-spring bracket, and the operations are much the same except the large flat surfaces are planed up in a shaping machine instead of being milled. The operations on the steering-gear bracket are similar to those that are performed on the radius-rod bracket.

No body or top such as used on the type B truck is

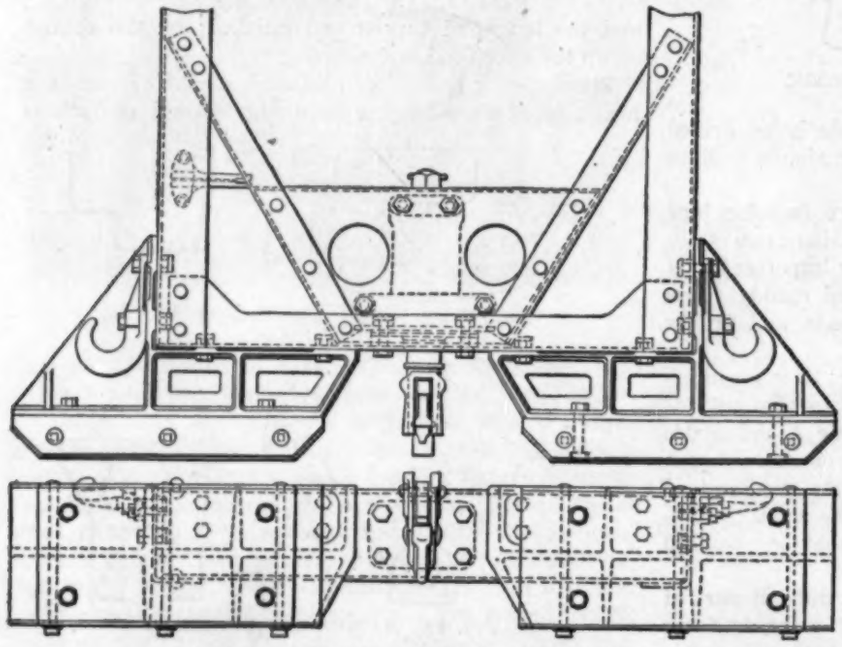


FIG. 21. DETAILS OF TRUCK, REAR END

supplied for these trucks, but wooden sills are bolted to the frame and a top is supplied over the driver's seat to give shelter in bad weather.

The parts herein described do not include all those which are machined in the shops, but they are typical of the general run of parts and give an idea of the work to be done.

The Trouble Man Discovers a New Lubricant

BY PHILIP C. GUNION

"I've got a good one to tell you this time," chuckled our Trouble Man as I paused at his desk to watch him labor with his report, "and it's about a new lubricant that you and I have never thought of using."

"I'm the boy that likes to hear about a new lubricant if there is one, to use it too if it is any good, so let's have it," I replied.

"Well, sir, I got called for by the Steel Turning Co. last week, and called quick, because one of our high-speed automatics had 'flown to pieces.' They are using them for turning those mean-looking little smoke shells, and every hold-up in their production brings a yell from the Big Boss.

" 'Flown to pieces!' they said over the telephone, and they sure spoke the truth. Every durned one of the tool-spindle bearings in the rotating head had worn through, and the centrifugal force had thrown the spindles out and made a lovely mess. You could see how two of the spindles had worn through first, and of course when they broke away the rest went too, and a sorry-looking automatic it was.

"It took me three days to replace those bearings, fit them and get that machine in good condition again; had to work overtime on it too because they needed it so bad.

"I got her fixed finally though, and put in a bar of stock to try her out. She ran smooth as silk, and I turned to the men who were watching me and said, 'There, she is as good as new.'

"They were the Super, the Master Mechanic and the Shell Foreman, and I thought that was my chance to rub it into them about the scandalous way the machine had been treated.

" 'Couldn't the man who was running this machine see that the bearings were most worn through?' I pulled, keeping my eye on the Master Mechanic, knowing it was his job to inspect these machines.

"They looked at each other kind of funny and the Super laughed a little before he explained it to me. 'The man who was operating that machine isn't with us any more. He had original ideas of his own that were too expensive.'

" 'What's the matter,' I said, 'did he think he could run this high-speed machine without oiling the bearings?'

" 'No,' the Super gave me back, 'he figured that the bearings were running hard and that something more than oil was needed, so he just put in something to make them run smoothly.'

" 'Graphite?' I guessed.

" 'Emery,' he replied.

" 'Those spindles came through the bearings like a hot knife through butter,' the Master Mechanic added disgustedly."

"Marvelous are the workings of the human mind," I replied when the Trouble Man had finished.

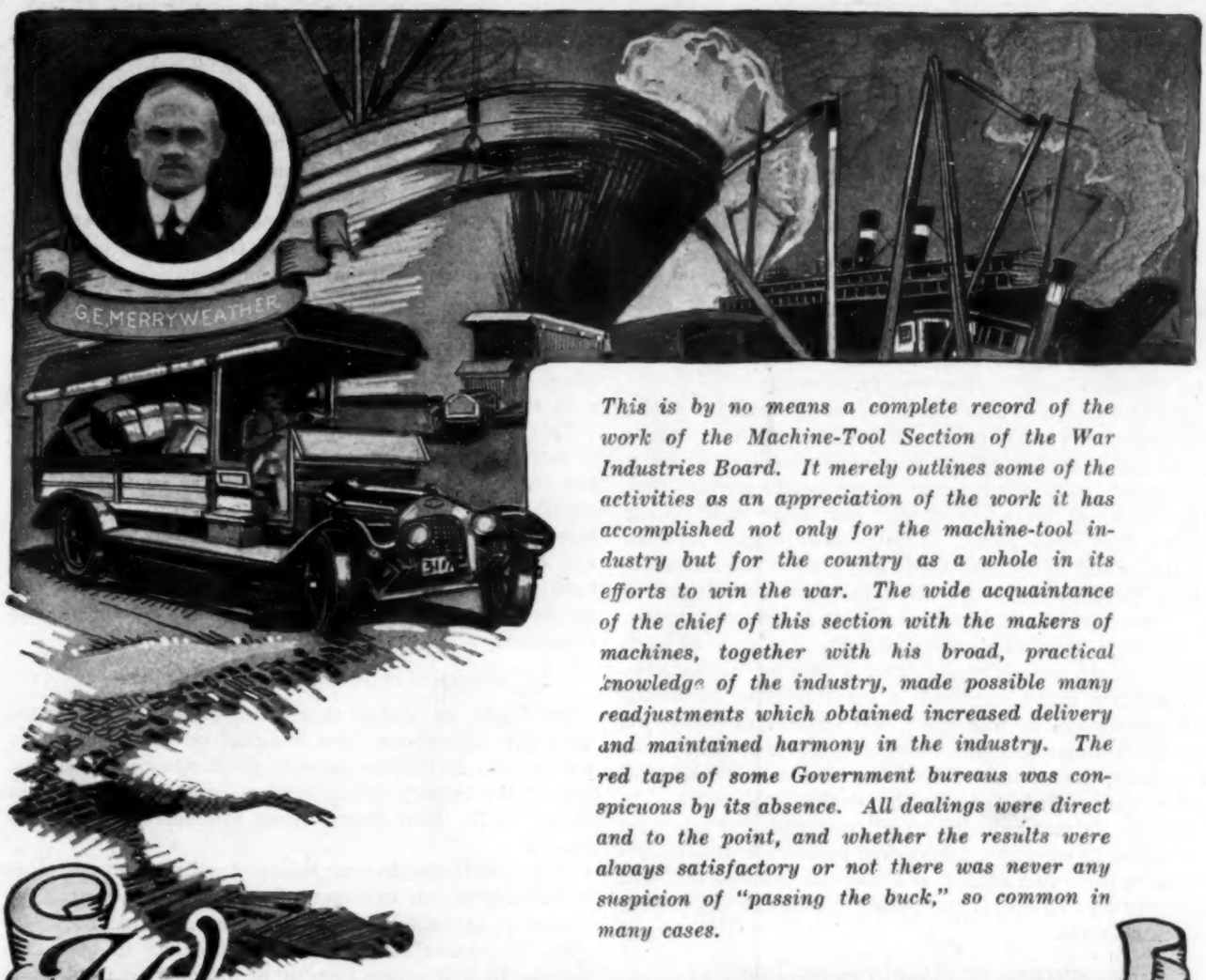
"You said it," he agreed, as he took a fresh hold of his pencil and went on with his report.

A Storm-Tight Roof

BY ROBERT GRIMSHAW

An absolutely storm-tight roof may be made by first covering the rafters with 1-in. thick hemlock boards; then with tarred paper held down by ¾-in. nails, and washers 1 in. in diameter. On this is spread a thin layer of cement, and before this sets, slates are laid, being lapped and nailed in the ordinary manner, rough side down.

No lightning-rod man or mason with heavy shoes, much less storm or wind, can loosen slates thus held by cement and nails—nor can any snow sift through nor rain leak in. Even if a slate is broken it is held firmly and stays in place.



This is by no means a complete record of the work of the Machine-Tool Section of the War Industries Board. It merely outlines some of the activities as an appreciation of the work it has accomplished not only for the machine-tool industry but for the country as a whole in its efforts to win the war. The wide acquaintance of the chief of this section with the makers of machines, together with his broad, practical knowledge of the industry, made possible many readjustments which obtained increased delivery and maintained harmony in the industry. The red tape of some Government bureaus was conspicuous by its absence. All dealings were direct and to the point, and whether the results were always satisfactory or not there was never any suspicion of "passing the buck," so common in many cases.

Work of the Machine-Tool Section of the War Industries Board

THE Machine-Tool Section of the War Industries Board had perhaps a closer contact with the makers of machine tools and the manufacturers of war products than any other. Broadly speaking, the government dealt only with the contractors. But the subcontractor was an important factor and it became as necessary to see that he had adequate machinery as it was for the Inspection Division of Ordnance to see that his product was right. So the subcontractor came to the Machine-Tool Section for aid in obtaining his equipment.

This meant more than getting the machines; it meant in some cases studying the work to see what machines would be needed and what machines could be utilized in case the desired machines were not available. Men like DeLeeuw, Norris, Flanders, Greenleaf, Baker, and others were engaged to go over plans and specifications, to suggest ways and means of doing the work, and to make time studies where desired.

The section made an inventory of all machine tools for foreign shipment on the docks at various ports, which was a large amount at the time. This stock was held for distribution so as to best serve the interests of this country and its allies, a big proportion of it being utilized in this country. It was, however, handled so judiciously that the machine-tool market was in nowise disturbed by the additional supply.

When the programs of the different departments began to take shape there was a rush for machine tools, each department and section trying to get its supplies first, regardless of the delay to the others, and with its usual foresight the Navy tied up much of the large machine-tool capacity for two or three years. One of the tasks of the Machine-Tool Section was to endeavor to get the coöperation of the different departments and to study the machine-tool requirements of each. This was not only with a view to finding what machines would be needed but when, so far as could be estimated, it would be necessary to have them.

Taking cylinder-grinding machines as an example,

instead of giving each shop its full quota in the order of its priority every shop received a portion of its grinding machines instead of one getting its full order. In this way the making of cylinders was begun in several shops at about the same time.

Every effort was made to prevent hoarding machine tools both by our own and by foreign buyers. One of the worst examples of hoarding was that of the Langley aviation field at Hampton, Va., which obtained most of its machine-tool equipment before the buildings were ready for them. Instead of surrendering part of the equipment, some of which was urgently needed elsewhere, it was allowed to stand in the open for months, protected only by tarpaulins. This however was before the Machine-Tool Section was functioning.

Many foreign orders were for stock machine tools, this being the usual custom followed, but these orders could not be recognized, so it became necessary to get a statement from their home governments saying that the machines were for direct war work and telling where they were going. This procedure gave an idea of the actual immediate needs and guided the manufacturer more intelligently. Had this not been done our own program would have been delayed several months.

Machine builders were asked to send a copy of each day's orders and shipments and a copy of his catalog. In addition every shop sent a monthly report showing the percentage of war work, the amount of shipment, the work under way, the number of hours the shop was run daily, the number of men and women employed, and other data. This information enabled the section to allot the fairest priority on all materials for machine tools and to exempt machine-tool builders from restrictions on their fuel supply, as Government shops that had priority on fuel could not operate because of not having machine tools.

Recognition of Machine-Tool Industry

The importance of the machine-tool industry has been thoroughly established. At one time at least 40 per cent. of all priority orders was for machine tools and they received a rating of A6, which is next to urgent Government necessities on the last priority ruling.

Not only were contractors helped by direct advice and planning, but the supply of machine tools was largely increased by the accretion of additional facilities for building machinery. Shops that had heretofore built bakers' machinery or turned and planed stone columns for monuments and churches were utilized to make such parts of machine tools as could be made by their equipment. In some cases builders of woodworking machines were lent patterns and drawings of much-needed machine tools, which they began to supply very quickly; similarly builders of engines and air compressors made heavy lathes during the emergency.

The whole machine-tool trade was on war work when the armistice was signed. Much of the program for the new gun machinery is not 10 per cent. completed and a lot of the machines built had not yet been installed. These should be carefully inventoried and fed into the market judiciously, as was done with the machines taken from the dock.

Some idea of what has been accomplished by the machine-tool industry may be gathered by noting the increase in its total product, which this year is believed to be between three and four times above the normal. In round numbers this means 1,000,000 tons of machine tools of an estimated value of $500,000,000.

There are now approximately 68,000 men and 4000 women in the machine-tool shops of the country, to which should be added probably 20 per cent. for the shops of subcontractors who are making some of the parts. This means that many of the shops have been enlarged beyond their peace-time needs, a matter that should be carefully considered in the new tax bill. The new bill should also take into consideration the excessive prices paid for much of the material on hand, which should be rated according to its normal and not its inflated value. In some Government contracts this is taken care of by amortization, but this is not the case with the machine-tool contracts.

This increased capacity also increases the overhead in normal times, and every effort should be made to find legitimate means of utilizing these capacities. We should know the exact possibilities of trade in the different countries, these data to be gathered by men who are thoroughly familiar with the industry. Proper banking facilities must also be assured to carry the necessary credits to conform with the customs of the countries.

Prices Not Advanced in 17 Months

It should be stated that machine-tool prices have, with few exceptions, been maintained at more nearly prewar standards than those of most other commodities, few of the large builders having increased prices since June, 1917. How many other producers can say as much?

It is gratifying to note the solidarity of the machine-tool industry, an evidence of which is the hearty coöperation invariably extended to the Machine-Tool Section. It is doubtful if this spirit exists to the same degree in any other branch of production, and it is certain that the industry will never forget the service rendered by the Chief of the Section, George E. Merryweather, and his able assistants. His has truly been a service to the country, for he has protected the interest of the Government as carefully as he has that of the industry.

It is not easy to look on both sides of a question at the same time, especially when one of the sides involves one's line of business. There are very few men who can do this, but we have had ample evidence that it is possible, and the industry can well be proud of itself and its representative.

Manifolding Shop Orders

By Robert Grimshaw

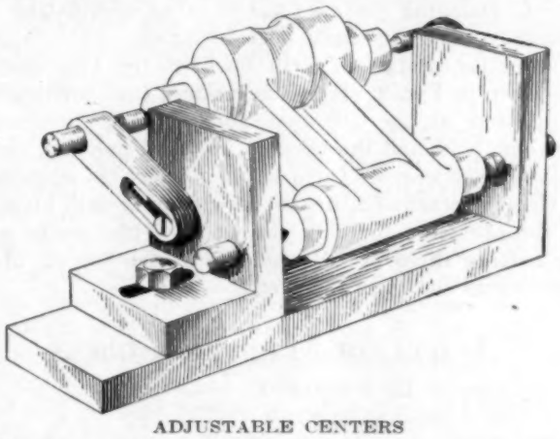
Many firms using manifold copies of shop and office forms have the blanks printed and blocked in sets of different colored paper, the idea being to have a separate and distinct color for each person or department receiving a copy of the order.

The gathering and binding or padding of such forms is expensive, but their cost may be greatly reduced by using only white paper and employing various colored manifolding paper to produce all but the face copy. This also permits making fewer copies of any one form than the maximum provided for without wastage.

Adjustable Centers for Pattern Work

By A. E. Holaday

The sketch shows a device for accurately locating the centers upon several sets of small patterns that were required to be very close to measurement in this respect.



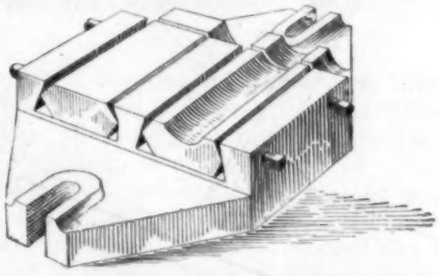
ADJUSTABLE CENTERS

While being soldered the patterns were held on the centers which were accurately adjusted to the correct center distance, and the work was accomplished very quickly and satisfactorily.

Shop and Drafting-Room Kinks

By C. J. Converse

On page 445 of the *American Machinist* I came upon an illustrated article pertaining to the machining of ammunition-truck parts for the Canadian government, which says that the lathe beat out the milling machine



FIXTURE FOR MILLING PARTS

in the manufacture of those parts although it had an extra operation to perform.

Nothing is said of the accuracy of the work, but if it has reasonable tolerances I fail to see how the lathe could face two sides and then drill a hole equal to one-half the length of the piece and still win out from the milling machine when the latter had to mill only two sides, the groove being cut at the same time with a convex cutter.

I read also that it was agreed by several good mechanics that they would have processed it on the milling machine, and I believe they were right. With several thousand to make they could well afford to make a good fixture to put the job on a manufacturing basis.

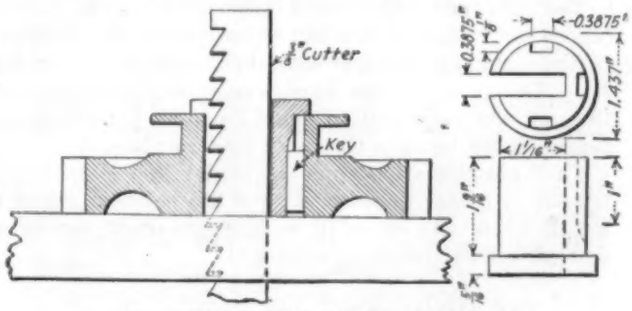
The sketch shows a fixture for holding the work so that it will be finished in one operation on the milling machine. Stops are to be applied to take the thrust from the cutters and the bedding points are to be the proper height for the two parts. One piece will thus be finished at each pass.

I judge these parts to be small and the limits such as will permit milling. With this device and a live operator the company should make money on the job.

Cutting a Four-Spline Gear Without Special Tools

By V. C. Bowser

Having occasion to cut four splines in each of a number of gears and these splines having to be very accurately spaced I made a plug, as seen in the sketch, to fit the bore of the gears very closely, the plug



CUTTING FOUR SPLINES IN GEAR

having three keyways about 1 in. long, and one slot $1\frac{1}{16}$ in. deep cut the full length, this latter slot serving to guide the cutter bar.

I used a Davis keyseating machine, cutting the first keyway in the ordinary manner, then turned the plug one-quarter way around and placed a closely fitted key in the keyway just cut and the corresponding keyway in the plug, thus locating the plug for the second keyway.

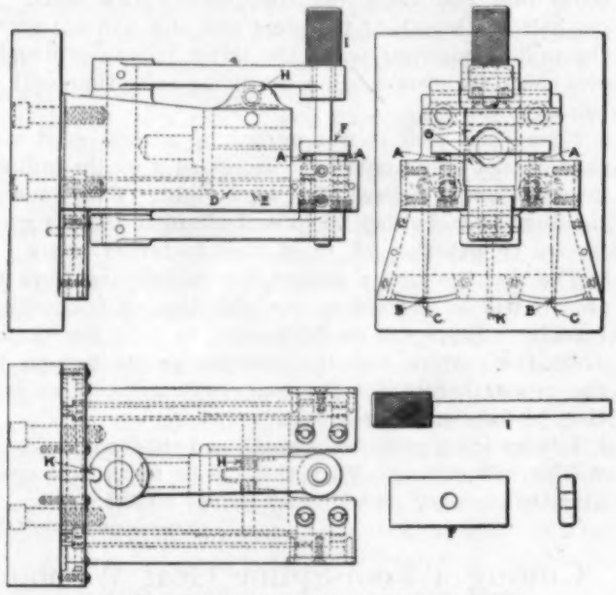
This operation was repeated until the four cuts were finished. I have cut over one hundred gears in this manner without a single rejection.

[There are two cuts too many in this plug. If the cutter slot and first keyway are accurately spaced to 90 deg. no other keyway is necessary.—Editor.]

Gage for Milled Slot in Valve Tappet

By Wallace F. Oliver

Considerable difficulty has been encountered in obtaining accuracy in the milling of the cam-roller slot in valve tappets. It is obvious that the roller must ride perfectly; also attention must be given to the position



INDICATING GAGE FOR VALVE TAPPET

of the drilled hole. The sketch shows the assembly of a gage to detect errors, if there be any.

The spring plungers *A*, four in number, actuate the indicator points *B* and *C*, the upper pair through shafts *D* and the lower pair through tubes *E* inclosing the shafts.

The hardened and ground piece *F* is placed in the tappet slot, which is then put in position in the V-blocks *G*, the clamping being effected by means of the spring *H*. The plug *I*, also hardened and ground, is put through the yoke and through the drilled hole in the tappet, there being a clearance hole in plate *F*.

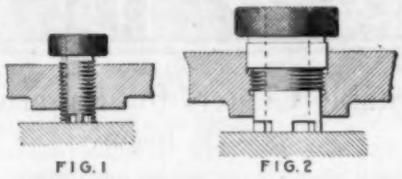
Thus any deviation from the center line will be registered by center indicator *K*, and the pointers *B* and *C* will indicate any error in milling either off center or vertical or horizontal angularity.

Drill Bushings for Clamping Work in Jig

By Joseph A. Ahlers

There is some question as to the advisability of using drill bushings for clamping work in a jig. It can neither be said that the practice is a good one nor that it is entirely useless, because it depends to a great extent on the design of the bushing itself. Occasions arise, as every tool designer knows, where such a bushing can be used to advantage and avoid a complicated and expensive fixture.

Fig. 1 illustrates a type that is practically useless except where the hole to be drilled does not have to be accurate, and of course in such a case the hole could be laid off closely enough and drilled without a guide. This design is poor, first, because it requires tapping an absolutely straight hole in the jig, which is a difficult task; next, because the threads must be, or should be, ground, and few shops are equipped for grinding threads, and lastly, because the wear on the threads



FIGS. 1 AND 2. RIGHT AND WRONG WAY OF MAKING A CLAMPING BUSHING

due to clamping destroys the fit, thus eliminating any accuracy that may have been attained.

A better design of drill bushing for this purpose is shown in Fig. 2. It will be noticed that this bushing is piloted at the top and bottom, thus insuring a straight hole, and the threads are used only for clamping, so that wear on them will not affect the alignment.

One important feature on all clamping drill bushings is the provision for chip clearance. This can be made by cutting three or four notches at the bottom of the bushing as shown in the sketch.

Wiper for Magnetic Chucks

By Herbert E. Hollman

Shepherds Bush, Wales.

The device here described has proved a great time saver to men working on grinding machines employing magnetic chucks; also in a variety of cases where surfaces have to be cleansed of wet grindings, milling swarf, etc. It is easily made, consisting merely of a length of tubing split throughout its length, with a strip of sheet rubber or heavy material sprung into the slot, and fitted with a knurled handle attached by rivets. It will be found that by its use a chuck can be swept quite clean and dry in a

WIPER FOR MAGNETIC CHUCK

moment, and it has the further advantage that no shreds of cleansing material can obtain entry into the water-circulating system.

EDITORIALS

In Connection With Export Trade

MANY people look on export trade as a sort of reservoir into which they can unload the products they cannot sell in the home market. But there is more to the question than shows on the surface, for the same principles underlie export and domestic business—the exchange of what we make for what is made by someone else.

When we buy a pair of shoes we exchange money, received for our labor and representing work we have performed in producing some product, for them. We do not confer any favor on the shoedealer by the transaction, and if the shoes are satisfactory and the money is not counterfeit the exchange is mutually satisfactory and both should be contented.

* * *

When we sell machine tools to a customer in this country we simply exchange our labor embodied in its production (whether in design, manufacture or sale) for the labor of someone else in some other line. Eliminating the medium of money, because it is apt to confuse, we can say that we exchange a milling machine for a truck. Both of us get equal value because we need the truck in our business of building milling machines and the truck maker needs the milling machine in the building of more trucks. We make the exchange so as to aid each other in further manufacture, and it is beneficial if we have been honest and displayed good judgment in selecting the articles.

* * *

The same principles apply to export trade, although we invariably overlook the exchange part of the transaction.

The only reason for foreign exchange, the same with domestic exchange, is that the parties desire each other's product more than their own. The shoemaker exchanges part of the shoes he makes to the makers of hats, coats and trousers because he can only wear one pair of shoes at a time and because shoes alone hardly make a complete wardrobe for our climate and ideas.

* * *

In order to sell machine tools abroad we must first find countries that need them more than the things they make or raise. Russia, for example, raises grain and cattle and also produces minerals and oil. Whatever machinery she obtains from this country must be bought with the commodities she produces in excess of her needs. And we must take these commodities in exchange for our machinery or else have someone else take them and trade with us for an approximately equivalent amount.

The machine-tool builder has no direct use for either grain or cattle, so he must find some means of making the trade. This is done through the medium of money or exchange. It is just as though some large merchant firm such as Sears, Roebuck & Co. did a bartering or exchange business. Farmers would send them wheat, corn, fowls, etc., and receive a credit slip. Machine-tool and other machinery builders might do the same. Each could take the credit slips and purchase any article from any desired department. But in each case it is evident that our own products would not be wanted unless there was demand enough from the other producers to keep them moving.

* * *

Both quantity and price must be considered. If there were a demand for only one hundred milling machines a year it would be useless to build two hundred. If the one hundred a year could be exchanged for enough food and clothes and other things to live on for a year the surplus time could be utilized in some other way—in cultivating a garden or helping out in some line that was more in need of workers—perhaps in devising new ways on which the milling machine might be useful, and so increasing the demand for it.

To continue the illustration of the primitive mode of exchange let us consider the world as consisting of two islands, each inhabited by one family. If each island produces all its family requires there would be no need for trade between them. If, however, one island raises bananas and the other peanuts exchange may be advantageous to both. But the only exchange would be the surplus of each over the needs of the family requirements, and if one boatload of bananas would obtain all the peanuts the family desires, it would be foolish to raise more than one boatload of bananas. Contrariwise should the peanut growers insist on sending two boatloads of peanuts and getting two loads of bananas, they would be laying the foundation for inter-island strife—which is one of the dangers of all export business.

* * *

The great need of the world for years to come will be production of all sorts to make up for the terrible destruction that has been carried on for the past four years. The product of labor on the natural resources is the only source of wealth, and we must all work the harder, as the result of the great war, to bring the real wealth back to normal. Because of this we must avoid all things which might lead to trade differences with other countries, and remember that whatever we export is so much of our labor and resources gone to another country and that unless it brings us at least an equivalent in the things we need we are losers instead of gainers. Gold is a poor substitute for meat and drink—it is only a yardstick with which to measure values.

The expert question requires careful thinking from many angles. It is not a one-sided proposition nor an answer to all of our various machinery-building problems.

Thirty Ninth Annual Meeting of the

THE thirty-ninth annual meeting of the American Society of Mechanical Engineers, now transacting its business at the society's headquarters at 29 West 39th St., New York, is being treated to a number of able papers by prominent men. At present it is only possible to give our readers an excerpt of one address—that of Charles T. Main, the president of the society—but reference to the other treatises will be made in future issues of the *American Machinist*. Mr. Main said in part as follows:

Early in the war the American Society of Mechanical Engineers, in common with other engineering societies, tendered its services to the President of the United States. This offer was promptly accepted; and as the war has developed and the needs for service have grown the society has patriotically responded to the many calls which have come to it.

In the matter of fuel conservation the society has been very active through its membership on the Fuel Conservation Committee of the Engineering Council, in coöperating with the Fuel Administration at Washington and by service of its members on commissions in different states.

Action with respect to munitions and gages passed at the society's meeting in Cincinnati resulted in a conference at Washington at which the heads of the Army, Navy and other departments were present, and further action was taken which resulted in having certification of all gages at one place, thus tending to insure uniformity of product. Later it was decided this would be undertaken by the Bureau of Standards in Washington with branches at various industrial centers.

One of the most recent activities of the society is in connection with the readjustment of industries for war work, for which purpose a committee has been appointed, with representatives in different parts of the country, selected through the local sections of the society. The society was invited to send delegates to the joint conference in London on Air Craft Standardization. We sent as our delegates James Hartness, past president of the society, with Prof. W. F. Durand as an associate representative. These delegates were also empowered to take up with the British Engineering Standards Committee the standardization of screw threads.

While the society as an organization has made important contributions to the prosecution of the war this work is only a token of what its members individually have contributed in common with other engineers throughout the country. Its membership is represented in France on the Western Front, in the construction of water and sewage works, and in the great French arsenal for the repair of our equipment abroad. It has rendered effective aid in the organization of the construction division of the army and of the Ordnance Department and Shipping Board; in routeing merchant ships; in promoting motor transportation; in the classification of personnel for the army; in emergency technical war training, and in the instruction of soldiers in handling guns and ammunition. Its members are to be found in every department of the Government where expert engineering knowledge is required. Two members of the council of the society are in uniform in France and a third, as a distinct war service, is in charge of one of the largest shipbuilding yards. The society's service flag bears over 1400 stars, and noteworthy also is the scroll of honor of the civilian members engaged in producing the supplies that the blows struck by those at the front may be telling and effective.

A commission has been created by the United States Government for the standardization of screw threads, H. R. bill 10,852. It is mentioned in the bill that two of the members of the commission shall be members of the American Society of Mechanical Engineers. James Hartness, past president, and F. O. Wells, member-elect of the council, have been appointed as our representatives. A committee has been appointed to coöperate with the British Engineering Standards Committee on the standardization of milling cutters and other small tools.

It should be the aim of the engineer to render the best possible service, considered in a broad sense. It should be based on facts and not on theories or suppositions, and on scientific laws which if properly applied will give satisfactory results. Nothing should be taken for granted, and the work or statements of others should be carefully checked before being adopted. The success of a man will depend on his ability to produce results in an expeditious manner which shall be accurate, and in which good judgment has been used, so that the finished product, if it be a physical structure, will be adapted to the use to which it is to be put and shall have been accomplished at a reasonable expenditure. If it be a plan for action it shall be clear and concise and adaptable to the purpose for which it is intended. He should be able to understand men and to know them. He should be willing to share his knowledge with his fellow engineers, and inasmuch as he will do this through the society or other similar means his interests and outlook will broaden and the return to him will be multiplied. Integrity and perseverance in work and business and fairness and justice to all will in the long run count for more than brilliancy in attainments. Withal he must have a good stock of imagination and judgment, which is sometimes called "horse sense," in the application of fundamental principles to everyday problems. The true success of a man is not measured by the accumulation of money, but by the successful accomplishment of work which adds something to the general good of mankind and to the advancement of the profession. Let us then bestir ourselves and show a greater interest in and broader vision of the opportunities which now lie before us and which will increase in number and importance in the near future.

We are living in a period of profound importance to

the whole world. The social and political conditions and the ideals of some, and perhaps nearly all, the nations are in a state of flux. To a large extent this may be said of our own country. This state of uncertainty and uneasiness has overtaken many men in our profession, and it seems necessary therefore for us to consider with great care if it will not be necessary in the near future to readjust ourselves to the new conditions. There is a tendency to form new organizations to accomplish new objects, or with the hope of doing some things that the present organizations are doing in a better way. This is unfortunate, as it is unwise and inefficient to have so many agencies endeavoring to accomplish the same result. Consolidation rather than segregation, up to proper limits, is more desirable.

Standardization

There is now opening up to the profession the most promising opportunity of furthering the work of national and international standardization. It is the beginning of a real great international movement for standardization. All of our own standards committees are working under the general direction of the Standardization Committee, the sole duty of which committee is to see that the work of the various committees shall be in harmony with the general scheme, but not to prepare standards for any particular purpose.

Although the military conditions with the Allies of Europe are satisfactory there is a vast amount of work yet to be done in clearing up the whole situation, and our efforts should not be diminished until a satisfactory ending is reached. It is now time to give careful consideration to the readjustment after the war, so that this country shall maintain its national and industrial integrity with due regard to its obligations to other countries. We were unprepared for war, which was a possibility, and we are unprepared for peace, which is a certainty. The future will have problems and trials. The contests will not be of battle but of industry. The conquests will not be of territory or thrones but of markets. Plans have been under consideration for some time in England, France and Germany for regaining the commerce lost during the war. Upon our ability to resume our normal lines will depend to a large degree our prosperity at home and trade expansion abroad. Organized labor has its plans for the present and after-the-war period, which from all indications are very far reaching. The industries may have some plans, but they are not much in evidence. We had our labor problems before the war and they will be more complex after the war on account of the readjustment that must take place. The bulk of the men who have gone into the service will return; many women have gone into the industries and into work heretofore done by men only, and in many instances they have surpassed all expectations. The policy to be followed by foreign countries to regain their lost or impaired commerce will have a bearing on our problems. These and many other questions will tend to make this problem more complex. As business men, employees and employers we can individually bring influence to bear toward a fairly just and satisfactory treatment and solution of these problems, and as professional men without prejudice we should be qualified to discuss with impartiality these problems and act as arbiters of many questions of doubt.

Another one of the most important problems in which the society could be of great assistance is education. A committee was appointed to ascertain the availability of technical schools and laboratories and what other opportunities there may be for industrial training. Resolutions were passed and sent to the Secretary of War protesting against the diversion of engineering schools from their primary function of advanced technical education because of the persistent pressure for a training of technicians for the war. As a result of these resolutions the Secretary of War appointed a Committee on Education and Special Training. Another result was the nationalization of scientific schools and colleges. The Federal Board for Vocational Education has undertaken the work of reëducating disabled soldiers and sailors. It has made the following statement: "In dealing with the disabled man the board expects to treat him throughout as a civilian needing advice and assistance; to approve his choice of occupation unless, after careful investigation, sound opinion shows it to be in the end not advisable to train him to meet the needs of the occupation he has selected; to urge him to make the most of his opportunity to overcome his handicap by taking thoroughgoing instructions; to help him to secure desirable permanent employment, and to keep in close touch with him after he goes to work. The manufacturer should be greatly interested in this work of rehabilitation and should aid the board in every possible way. The War Department expects to train a large number before the year is out. These reëducated men, made proficient in some trade or operation suited to their remaining capabilities, are going to constitute the most available source of skilled labor for some time to come. They will probably be the most dependable labor in the inevitable period of unrest and readjustment after the demobilization of the armies when the country is settling back to a normal condition again. They will form a core around which the newer labor can center. The manufacturer who has the foresight to make liberal use of these retrained men is going to have an immeasurable advantage over his competitor who trusts to luck to get the help he needs out of the disbanding armies."

Conservation

Considerable saving in fuel has been effected recently by more careful attention to the burning of fuel and the use of steam in prime movers, but much more has been saved in simple, commonplace and commonsense ways of preventing waste of heat and power after it has been delivered from the boiler and engine rooms to the various rooms and departments about the plant. An example of the sort of work which engineers can accomplish in fuel conservation is that by the Advisory Engineering Committee to the Fuel Administrator of Massachusetts, all of the members of which, with one exception, are members of this society, in assisting in establishing in every plant and building using steam for heating and power a Fuel and Power Committee within its own organization, whose duties are: (1) To see that fuel is burned economically and to prevent waste of steam and power; (2) to initiate and carry on a campaign of education among fuel and power users; (3) to distribute among users, engineers and firemen an outline of the items of loss, and to supply information for

the purpose of saving fuel and power; (4) to assist local fuel committees in enforcing economies in wasteful plants, and (5) to enlist the services of engineers in carrying out this program. Similar work has been done by other committees in many states.

The generation and transmission of energy by electricity has changed conditions so radically in the last few years as to require the most careful study of the proper place and manner of the production of power for all purposes. The problem of power supply is intimately connected with the railroad and transportation problems, and a study of one involves the study of all other problems.

Delays in Transportation

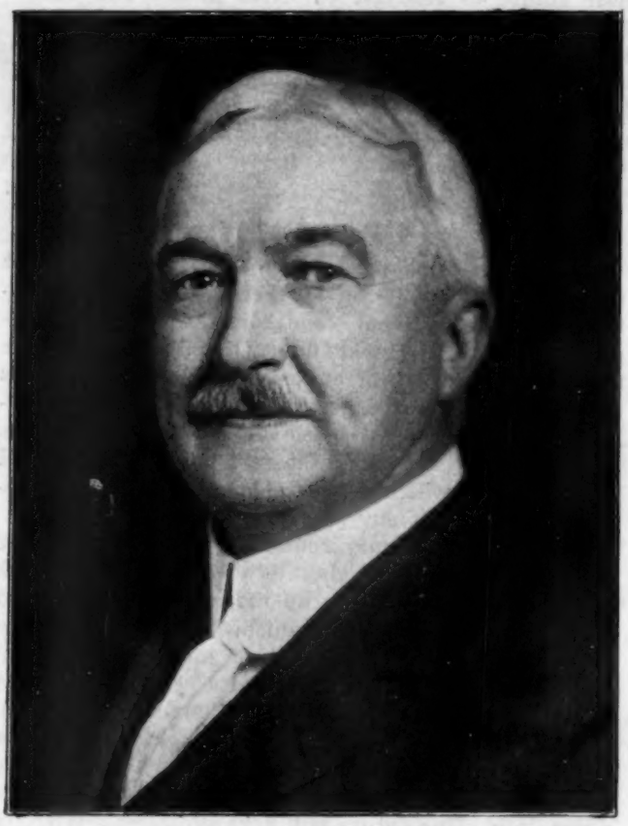
There have been serious delays in transportation of materials and supplies, and one of the principal reasons for coal shortage last winter was insufficient transportation facilities. It is stated that about one-quarter of all the coal used and transported is for the use of the railroads, and another large portion is required for manufacturing, lighting and power. Some of this necessarily must be used at the plants for heating and manufacturing purposes. Much of this traffic could be eliminated by the establishment of large steam-generating plants located as near the coal mines as conditions will permit, and near tidewater, where coal and oil could be brought in by vessels; by the development of hydroelectric powers, which are within reasonable distance of the market, and by the electrification of the railroads, with great trunk connecting and transmission lines. Incidental with the further development of hydroelectric power is the saving in labor required for the mining, transportation and burning of coal. The expense of such large developments at the mouth of the mines and at tidewater and of the development of some of the hydroelectric powers may be too great for private interests to undertake. The uncertainties and restrictions imposed have been such as to prevent the development of some of the possible water powers. More liberal legislation is needed to encourage these undertakings, in many of which the margin of profit is small and doubtful. Congress has now under consideration a water-power bill which it is hoped will encourage developments.

Officers Elected

The officers elected at the 39th annual meeting of the A. S. M. E. are: President—M. E. Cooley, professor of mechanical engineering and dean of the College of Engineering and Architecture, University of Michigan, Ann Arbor, Mich. Vice President—Fred R. Low, editor of *Power*, New York; H. B. Sargent, president of Sargent & Co., New Haven, Conn.; J. A. Stevens, consulting engineer, Lowell, Mass. Managers—C. L. Newcomb, general manager of the Deane Works, Worthington Pump Co, Holyoke, Mass.; F. O. Wells, president of the Greenfield Tap and Die Corporation, Greenfield, Mass.; C. R. Richards, dean of the College of Engineering and director of the Engineering Experiment Station, University of Illinois, Urbana, Ill. Treasurer—W. H. Wiley, president of John Wiley & Sons, New York. Secretary—Calvin W. Rice. Honorary memberships were conferred on Charles M. Schwab and Orville Wright.

New A. S. M. E. President

The president elected at the 39th annual meeting of the American Society of Mechanical Engineers is Mortimer Elwyn Cooley. He was born in Canandaigua, N. Y., March 28, 1855. He graduated from the United States Naval Academy in 1878; received an honorary M.E.



MORTIMER ELWYN COOLEY

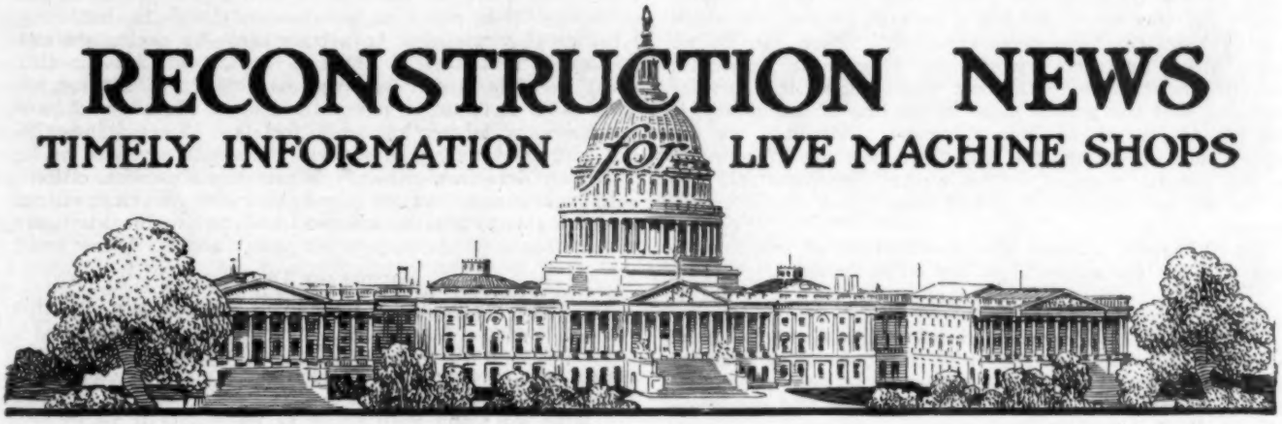
from the University of Michigan in 1885; LL.D. from Michigan Agricultural College in 1907, and Eng.D. from University of Nebraska in 1911. On Dec. 25, 1879, he married Carolyn Elizabeth Moseley of Fairport, N. Y. He has been a professor of mechanical engineering since 1881, dean of the College of Engineering since 1904, and dean of the College of Architecture since 1913, University of Michigan.

During 1879 Mr. Cooley was in the Navy and cruised in the Mediterranean and in 1880 on the Atlantic Coast; he was in the Bureau of Steam Engineering in 1881, and was Chief Engineer, U. S. N., 1898-99, serving on the U. S. S. "Yosemite" during the Spanish-American War. He was also chief engineering officer of the Michigan Naval Brigade from 1895 to 1911, and president of the Common Council of Ann Arbor Mich., from 1890 to 1901. He appraised the rolling stock and power plants of the Detroit street-railway systems in 1899; was in charge of the appraisal of the Michigan railways, telegraphs, telephones, etc., in 1900-01; assisted in the appraisal of the mechanical equipment of the Newfoundland railways in 1902; was consulting engineer of the Wisconsin railroad appraisal in 1903; had charge of the reappraisal of Michigan railways from 1903-5; was a member of the traction valuation committee of Chicago in 1906; appraised the Michigan telephone

properties in 1907; in charge of the appraisal of hydro, steam and electric properties of the Michigan Railroad Commission in 1910 and 1911; special investigator of public-utility properties in Minneapolis, Milwaukee, Cleveland, St. Louis, Boston, New York, Sault Ste. Marie, Red Wing, Buffalo, Evansville, Washington, D. C., New Jersey, etc., since 1906; chairman of the Block Signal and Train Control Board of the Interstate Commerce Commission 1907-12; he was a member of the Engineering Commission of the Chicago Exposition in 1903; Commissioner on Awards of the Pan-American Exposition, as well as a Fellow of the American Association for the Advancement of Science and its vice president in 1898; member of the American Society of Civil Engineers and a director from 1913 to 1916; member of Franklin Institute; of the Society for the Promotion of Engineering Education and vice president of same from 1908 to 1909; Society of Naval Engineers; Michigan Engineering Society and its presiding officer in 1903; Detroit Engineering Society and the Sigma Phi, Tau Beta Pi and Sigma Xi fraternities, and is a member of several clubs.

RECONSTRUCTION NEWS

TIMELY INFORMATION *for* LIVE MACHINE SHOPS



THE address of Harry A. Wheeler, president of the Chamber of Commerce of the United States, was a great speech and was divided into a discussion of international and national problems. Mr. Wheeler pointed out the need of open diplomacy instead of intrigue, with its trail of jealousies and causes for future wars; that business should be represented at the peace conference, and that the peoples of all nations must be considered. Statesmen, he said, are not as well versed in the needs of business as those who conduct the industries of the country and that with the new alignment of the nations the laws of commerce applied to peace treaties would be beneficial. The fundamentals of justice to all peoples must not be overlooked in the peace negotiations, and it is up to the United States to urge and insist that everything be open and that secrecy be not permitted.

One of the international questions of prime importance is the equitable distribution of raw materials, which are absolutely necessary to the economic independence of all. Some plan should be worked out whereby the natural resources of the earth should not be confiscated for the sole benefit of those nations which happen to be so situated geographically as to possess them within their borders. An equitable allotment of these resources would go far toward preserving peaceful relations, and the power to restrict this supply, when adjudged necessary by a court for punishing infractions of international law, would tend to preventing jealousies and intriguing. This would include the fixing of prices on a fair basis to all, and instead of being theoretical and altruistic was really an enlightened selfishness of the sort which was at the base of all desirable acts of this kind.

Mr. Wheeler pointed out the unsoundness of the economic boycott, which has been proposed at various times, and with it the similar unsound doctrine of the favored-nation clause. These both belong to the past and not to the present, and we must school ourselves to think in terms of the newer philosophy instead of the old and not include them in any treaty that may be made.

The question of ocean tonnage was likewise dealt with in view of the necessity of ships for our commercial development; also the wise and equitable use of the ships that have come into being as part of our war program. These, Mr Wheeler pointed out, must be operated in the interest of the whole world, which means, in the abstract, for our own best benefit. The pooling of the tonnage of all for transporting food, raw materials, the finished articles of commerce most needed, and later such articles as come more properly under the head of luxuries was also touched upon. The method of handling this tonnage, whether by government or by private ownership, is a question yet to be decided. But the best interests of the country must be considered and not the benefit of any group or individual.

One quotation from Mr. Wheeler's speech may well be carefully considered: "How shall we enter into possession of this new world—with the boastful arrogance of the foolish victor drunk with power, or with the patient humility of a chastened people intent only upon building a new civilization and a new code of human ethics on the wreck of the past?"

With this in mind he dealt with the many problems in the broadest possible manner, and no business man can read his speech without realizing the new duties before him; no representative of labor can fail to note the spirit of fairness running all through it, a spirit that imposes a duty on labor to enter into the new era in the same open attitude of mind.

Mr. Wheeler pointed out the error of not calling upon the business men of the country to send a delegation to Paris to be at the disposal of the peace conference whenever questions concerning the business of the world was being discussed. Both capital and labor should be consulted regarding questions which concern the welfare of the country. This policy however seems to be confined to the use of a mass of statistics gathered for this purpose, but Mr. Wheeler made it very clear that no counsel of statistics could possibly represent American business in such an important conference. This is very evident to those who have watched various attempts to run a business by a set of rules or with statistics gathered on cards or otherwise. Managing means sound business judgment based upon the particular conditions existing at the time, and can never be replaced by formulas.

He suggested that the War Service committees should be continued with the relations to Government reversed; that is, the Government should now follow business back to normal instead of attempting to lead it, as was necessary in getting into the war. These committees could be help-

ful in the matter of cancellation of contracts, the control of materials so that they could be slowly released into the market to prevent a disturbance of prices, and particularly that this should be done before the men who placed the contracts went back into civil life. There are so many little details in regard to contracts placed in the haste that was necessary when we went into the war and that can be known only to those directly concerned in the transaction that any attempt to handle this matter with a new organization is sure to be unsatisfactory to all.

One of the problems that will arise is that which the British call the "key" industries, meaning industries that are the key to other industries. Among these is dye making, which is the basis for much textile work. The trade of this industry has grown from less than $400,000 before the war to $17,000,000 a year at present, of which over $10,000,000 have been exported. There can be no doubt about the necessity of preserving these industries, the only question being the best way of doing it. Another instance, and one that is more in the line of machinery, is the manufacturing of snap fasteners. Although we imported them all before the war there now are 17 concerns in this country engaged in this work. These are only two of the 427 new industries, 215 of them being of a chemical nature.

Mr. Wheeler's address was the keynote of the convention and met the approval of the large audience.

Mr. Schwab's Address

Mr. Schwab, in a stirring address, pointed out the great necessity of operating the ships we have built and the difficulties which present themselves at present. It is necessary, he said, either to reduce the wages and conditions of service of American seamen to that of other countries; to induce the seamen of other countries to raise their wages to our standard, or to have the people pay the difference. This conclusion is true whether the ships are operated by the Government or by private capital. In any case the people pay the bill in taxes, and it is for them to decide which method is to be adopted. We do not believe that the American people want the standard reduced to that of some other countries; if they do the American sailor will again become a memory instead of a visitor in foreign ports.

Much of Mr. Schwab's talk dealt with the labor question, and as one of the largest employers in the world his words take on added weight.

"We face a situation today that to my mind is exceedingly critical and requires the attention of every astute mind in the country. When I undertook with my associates who have been so loyal and so able the construction of a merchant marine for the United States I realized that there was just one possibility of success, and that success was not to come about by reason of the shipyards or the engine works or the boiler works or anything else that we might construct, because that would require time and years of development, but it would be brought about in an emergency quickly by appealing to the best energies and the patriotic endeavor of the citizenship as represented by the workmen of the United States.

Fairness to American Labor

"I am one of the men who believes in the fairness of American labor. I am one of the men who believes that the only foundation upon which any of these things can permanently rest is the economic use of everything, whether it be labor, material, manufacture or what not. Any foundation of organized labor or capital that is on a false basis must fail.

"Our Congress, our legislature in Washington, realized it, and rightly and justly took steps to correct it. What has been true of capital will be equally true of labor, and therefore the education of the American laboring man must be to have him realize that his permanency and success and the success of the nation will depend upon labor conditions and capital conditions that are founded on economic principles first of all.

"I am not opposed to organized labor. I believe that labor should organize in individual plants or among themselves for the better negotiation of labor and the protection of their own rights; but the organization and control of labor in individual plants and manufactories, to my mind, ought to be made representative of the people in those plants who know the conditions.

"But, gentlemen, in the years gone by, I seriously doubt many times if labor has received its fair share of the prosperity of this great country. We as manufacturers have got to open our eyes to a wide vision of the present and the future with reference to our workingmen. We have got to devise ways and means by which capital and labor, which have often been termed synonymous, shall share equally, not in theory, but in practice. We have got to devise ways and means of education. We must not only talk about these things, but we must do these things. We have got to realize that many unjust demands will be made by labor as they probably have been made by capitalists and employers in the past. That is one of the lessons this great war has taught us—true democracy. The thing we have to do is to teach, not patronize; to educate and have the American laborer know and feel that he can stand with his head erect, as you can and as I can, and say with pride, 'I am an American citizen.' What does American citizenship mean except that any man to be a true American citizen must be able to hold up his head and feel within his heart that he has done his duty to his nation and his fellow men!

Autocracy Dead

"Matters will adjust themselves industrially in this country sooner or later by the natural course of events, but what we want to prevent is that sudden slip of the cog which will give us a social jolt that may be dangerous to our industries for years to come. We must be patient. We must go along with small or no profits if necessary. We must bend every effort to keep our employees busy, employed and satisfied. They must be made to realize the situation as we see it and be content to help us in that development. We must get closer together with our work people. We must listen with patience to their side of the story. The day of autocracy in government and labor has gone by. It is the day of democracy in which we now stand shoulder to shoulder for the protection of our mutual interests.

"Let us go home with our minds and hearts filled with determination that we American manufacturers and American business men are going to have successful accomplishments; that we are going to have it in an honorable way, and that we ask our great representatives in Washington, from the President and the Secretary of Commerce down, to help American business men help sustain the prestige of the American nation, and that we pledge ourselves to treat fairly with that great army of workmen who must share with us the prosperity and happiness of this great country of ours."

Machinery Group in Lively Meetings

Machinery Group, which also includes tools and power equipment, had a very interesting meeting which was well attended by representatives of the various industries in the group. The chairman of the group was A. O. Backert of the *Iron Trade Review;* the secretary was Fred H. Colvin of the *American Machinist.* A clearance committee was immediately appointed to care for the resolutions, which covered about every subject from patents to the metric system, the meeting going on record as being unanimously opposed to the adoption of the metric system by the United States, especially in the face of its rejection by the British High Commission on Standards.

The address of the evening was by Alba B. Johnson, president of the Baldwin Locomotive Works, who spoke of the work to be done during the readjustment of industry and the necessity for careful consideration of the tax laws, so that the business of the country will not be hampered in getting back to normal in the shortest time. He pointed out that as no one knows what will be the needs of the coming year no heavier taxes than were necessary should be imposed, but let each year take care of itself.

He pointed out that everyone must be prepared to make concessions in the interest of the whole country; that no one should expect a profit on work under way except as

to the amount actually performed, and that anticipated profits must always be decided in the negative.

There was a lively discussion on the resolutions, the machine-tool industries being represented by Charles L. Hildreth, H. W. Breckenridge and others. The resolutions cannot be given until they have been passed upon by the Clearance Committee of the Chamber of Commerce.

Mr. Farrell's Address

In the absence of James A. Farrell, who was scheduled to address the Chamber of Commerce on the subject of "Foreign Trade," his paper on this subject was read by Mr. Davis, secretary of the Foreign Trade Council.

Mr. Farrell sketched the history of the American foreign-trade movement and of the establishment of the National Export Council, which was erected in 1914 after the year 1913 had shown a retrogression in our exports due to unfavorable national laws. Among these the chief handicap to the development of American commerce abroad was the Sherman Anti-Trust law, which made it possible for European buyers to pit one group of American producers against another. The war and the passage of the Webb bill have removed these handicaps, and American business must see that they stay removed if we are to have foreign trade proportionate to our new mercantile marine.

Mr. Farrell pointed out that the productive capacity of the United States has been materially increased, making it no longer a matter of choice, but one of necessity, for us to consistently develop our foreign trade. To this end we must educate the public to become cosmopolitan investors instead of restricting itself largely to local investments.

Mr. Farrell discouraged the idea of attempting the economic boycott of Germany, stating that the bill that the Central empires will have to pay will make it necessary for them to maintain their industries.

A nation-wide coöperation, said Mr. Farrell, is needed to develop our foreign trade. Ample capital and concerted effort will be required. The fact that over 60 per cent. of our exports has been represented (in normal times) by three classes of commodities — agricultural instruments, mineral oil and iron and steel, each backed by ample if similar capital and effort are applied to other lines.

John D. Rockefeller, Jr., delivered an address on the subject of "Representation in Labor." He called attention to the fact that our war efforts have shown us the value of coöperative effort. Mr. Rockefeller stated that there are four parties to industry, namely, labor, capital, management and the community, each of which is entitled to and should have its voice in industrial affairs. He stated that labor unions do not at present comprehensively represent the whole of labor, and recited the findings of the "Whiteley Report" and other British studies of the subject of applying to labor the principles of representative government through ship representatives, local committees and district committees. Mr. Rockefeller stated it is his belief that the large part of the differences between capital and labor are due to the acts of petty officials, and advocated the representative plan as a means of avoiding these and other differences.

At the closing session of the convention Paul M. Warburg, former head of the Federal Reserve Board, spoke on the topic of financial reconstruction. Mr. Warburg stated that the term reconstruction as applied to this country means a reëstablishing of normal levels of living, working and financing. His conception of the financial position of the United States in the future was presented as follows: "As I look through the telescope into the period following that of transition I see a United States to which the world at large will be heavily indebted and to which annually hundreds of millions of dollars will be due as interest on loans extended, in addition to the hundreds of millions due in payment for the raw materials we shall be able to spare for other countries. I see an industrially highly developed country which, with the exception of a limited number of articles, will be capable of producing most of the necessaries of life for the consumption of its own people. I perceive a country amply protected by a vast annual international credit balance; a country which by keeping some portion of its foreign-security holdings in the form of reasonably short obligations should be able to protect itself against any serious encroachment upon this creditor position; a country owning a huge gold stock; a country, in short, which need not give itself any great concern as to its power to maintain the parity of the dollar exchange all over the world." Mr. Warburg told of the tremendous development of American banking which has been brought about during the war and which will have a vital effect on American industries after the war. He stated that as far as the banking situation is concerned the deflation from the present standards will have to be brought about by the saving of the people and by the contracting of loans following the shrinkage of the prices of goods and reduction of the volume of inventories.

The five days' work of the Reconstruction Congress crystalized the adoption of 35 resolutions. One of the most important of these had to do with a concerted effort on the part of American business men to extend and promote American commerce, and particularly foreign trade, through the appointment of an American business commission that shall proceed at once to Europe to study the reconstruction needs in European countries as well as to be available to the peace delegates of the United States for any needed information on subjects relating to industry that may arise at the peace conference.

The American merchant marine, in the opinion of the delegates to the Reconstruction Congress, should be operated "under American control and kept safe by such legislation as may be necessary to insure stability and its lasting value to American industry." Private ownership of the merchant marine was not demanded.

The subject of Government ownership of railroads was touched upon forcefully in resolution 12, which reads: "The Congress of the United States should speedily enact legislation providing for the early return under federal charters to their owners of all railroads now being operated by this Government under federal regulations, permitting the elimination of wasteful competition, the pooling of equipment, combinations of consolidations through ownership or otherwise in the operation of terminals and such other practices that will tend to economize without destroying competition in service."

Opposition to Government ownership or operation of telegraph, telephone and cable lines was expressed in another resolution.

It was the opinion of the delegates as stated by resolution that there be an immediate adjustment of Government obligations on canceled war contracts, and that an agency be created to determine the losses incurred in effecting the settlements. This recommendation is along the lines of the efforts that the *American Machinist* has made to secure a gradual industrial readjustment.

Anti-Trust Laws

The revision of the antitrust laws was asked in order to permit combinations that would prevent economic waste. The elimination of competition through price fixing, however, was not asked for in connection with foreign trade.

Key industries developed in this country since the war and which are vital to other American industries must be given sufficient protection to insure their extension and successful development. Many of these industries will be forced out of existence through foreign competition, provided adequate protection is not given, and it was the sense of the convention that the Government should at once proceed to ascertain the industries which have been developed during the European War and to ascertain those the maintenance of which are indispensable for the safety of our industrial structure and our military establishment. When these pivotal industries have been ascertained, suitable means, in view of their nature and situations, should at once be provided for their encouragement and preservation.

It was recommended that all war regulations of industry and restrictions should be removed as speedily as possible. A rational taxation scheme based upon an intelligent study of the capabilities of industry was recommended. The use of the present inflated inventory values in determining taxes was protested as unfair.

SPARKS FROM THE WOR

E. C. PORTER,

Jobs for Disabled Men

Pennsylvania Prepares to Rehabilitate Disabled Sailors and Soldiers on Their Return

The Pennsylvania Department of Labor and Industry says in its bulletin that the state of Pennsylvania has 49,417 jobs for soldiers and sailors who have been disabled.

Seven months before the Smith-Sears Vocational Rehabilitation act was passed by Congress and approved by President Wilson on June 27, 1918, the Pennsylvania Department of Labor and Industry sent out questionnaires to 30,000 manufacturers and industrial establishments in the state inquiring what employment could be given to disabled men returning from service abroad. The disabilities mentioned amounted to 38 and comprised the loss of fingers, hands, arms at elbow and shoulder, loss of foot at ankle, of leg at the knee, below it, or at the hip, blindness, loss of speech, and "repulsive facial disfigurements."

The returns from 900 establishments in 60 counties offered employment for 49,417 men, and include dairies, steel works, railroads, silk mills, paper mills, cigar factories, lumber camps and department stores. Of the 49,417 offers 16 were in agricultural pursuits, 908 in clerical positions, 47,321 in industrial establishments and 1172 miscellaneous.

* * *

Red Cross Machine Shop in Serbia

The most modern machine shop in the Balkans was put up recently by an American Red Cross unit in Serbia. American machines and tools and American shop and agricultural methods have been introduced into this devastated country. Tractors, trucks, harvesters, plows, mowers and all sorts of small tools were taken over last summer by an agricultural unit.

The shop was put up at an expenditure of $8000. It is located at Kremljani, a bandits' town before the war. Power is supplied by a dynamo driven by a gas engine, and the various machines for wood and steel working are operated by separate motors. There are drilling machines, lathes, pumps, planing machines and other equipment. Pieces of iron and steel 10 ft. long and up to 5 in. in diameter can be handled. There is also equipment for welding.

A large sawmill has been put up in the hills near by where there are fine old forests of beech and white pine that furnish an inexhaustible supply of building material for barracks, huts and shops. Some of the beech forests are so dense that it is difficult to read a newspaper in them at noon. Beech logs 100 ft. long and nearly 5 ft. in diameter at the butt are not uncommon.

Men to operate the shop and sawmill were provided by the Serbian government from among mechanics who were unfitted for service in the army. Many of these men were workers in the shops and mills of Chicago, Indianapolis, San Francisco and other cities of the United States.

* * *

Imports and Exports Decrease in October

Imports as well as exports of merchandise decreased in October as compared with the preceding months of this year, according to a statement issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce.

Imports were valued at $247,000,000 as against $262,000,000 in September, and $273,000,000 in August of this year, and $221,000,000 in October, 1917. During the 10 months ending with October, 1918, the value of imports was $2,569,000,000 as against $2,504,000,000 in 1917.

Exports amounted to $503,000,000 as against $550,000,000 in September, and $528,000,000 in August of this year, and $542,000,000 in October, 1917. During the 10 months ending with October, 1918, exports amounted to $5,063,000,000, a decrease from $5,146,000,000 in the same period a year ago.

Imports as well as exports of gold are decreasing. The imports amounted to less than $1,500,000 in October of this year against over $4,000,000 in October, 1917, and during the 10 months ending with October of this year to $58,000,000 against $532,000,000 in 1917. Gold exports during October, 1918, amounted to $2,000,000 against $11,000,000 a year ago, and during the 10 months ending with October of this year to $36,000,000 against $360,000,000 last year.

The trade in silver continues to increase. Imports increased from $38,000,000 during the 10 months ending with October, 1917, to $62,000,000 in 1918, and silver exports increased in the same period from $69,000,000 to $197,000,000.

* * *

Philadelphia Engineers Meet

The Engineers' Club of Philadelphia will hold its regular monthly meeting on Tuesday, Dec. 17, 1918, at Witherspoon Hall, Philadelphia. Frederick K. Morris of Columbia University will read a paper entitled "The Fourth Year." The paper will be illustrated.

Delegation of Engineers Goes Abroad

At the invitation of the Société des Ingénieurs Civils and a committee of the French Engineers' Congress, and with the official approval of the French government, a delegation of American engineers sailed on Dec. 4 to study with French engineers certain problems involved in the rehabilitation of France after the war. This delegation was invited to Paris to examine in joint conference questions of the utilization of commercial ports, the development of navigable waterways, the development of water power and the improvement of road systems. The invitation was sent to the American Society of Civil Engineers and was accepted at once by cable, the acceptance stating that such a delegation would be organized in coöperation with the other American national societies.

The following delegates were appointed:

By the American Society of Civil Engineers, J. F. Case, chairman; George W. Tillson, George W. Fuller, A. M. Hunt, Nelson P. Lewis, and George F. Swain.

By the American Society of Mechanical Engineers, Charles T. Main, president.

By the American Institute of Electrical Engineers, Lewis B. Stillwell.

By the American Institute of Mining Engineers, E. Gybbon Spilsbury.

* * *

No Restriction on New Construction

For 10 days after the signing of the armistice prospective builders were required to get permits for nonwar construction from state Councils of Defense, but since Nov. 21 no licenses of any sort have been required for new construction. This removes the last restriction on buildings, of those started early in the war, according to a statement by B. M. Baruch regarding the latest ruling of the War Industries Board.

* * *

General Crozier to Retire from Active Service

By direction of the President Maj.-Gen. William Crozier, U. S. A., on his own application, is retired from active service, to take effect Jan. 1, 1919, after more than 42 years of service. Maj.-Gen. Crozier will proceed to his home. Maj.-Gen. Clarence R. Edwards will succeed General Crozier in command of the Northeastern section of the Ordnance Department.

LD'S INDUSTRIAL FORGE

NEWS EDITOR

Great Industrial Progress in India

Industrial development in India, owing to the war, has affected to a great extent the older activities, such as tanning, the manufacture of jute and cotton weaving, for which electrical appliances and machinery have been introduced. The industrial field has been widened by hydroelectric, iron and steel working plants and engineering industries generally, in all of which a large amount of American machinery has been used.

Shells, rivets, bolts and nuts have been produced on an extensive scale. Machines that were never produced before in India have been made. A company has been started to manufacture brass and gun-metal work. One large firm manufactures articles formerly imported to a large extent, such as jute-mill machinery, lathes, steam hammers, winches and baling presses.

A large iron and steel company, the plant of which is near Calcutta, has become so extensive as to give the town the pseudonym of the "Pittsburgh of India." This development is due to the necessity of meeting the constantly increasing home and foreign demands. The company is engaged almost entirely on government orders, particularly rails, but the plate and structural steel demand is rapidly increasing in connection with the growth of India's shipbuilding. The company has a contract with the government for 10,000 tons of plates a year for 10 years, and is constructing a mill capable of rolling plates up to 90 in. wide. The plant will contain two sets of three high rolls with the necessary straightening rolls, and will have a capacity of about 100,000 tons a year. In addition the company is building a large structural shop, in which it will be possible to roll beams of 3 to 24 in., and a new steel-casting plant, in which steel castings up to 35 tons in weight will be poured.

Other industries have extended their operations since the war began and are preparing to expand still further.

Industrial development has long been regarded by many in India as the necessary accompaniment of political progress, and it is now regarded as likely that a Department of Industry will be established to supervise this expansion.

* * *

"Faith," the Concrete Freighter, Completes Long Voyage

The reinforced-concrete ship "Faith," which was launched in San Francisco last March, reached New York recently after a voyage of 12,000 miles, during which stops were made at Vancouver, Lima, New Orleans and Havana. On Nov. 25 she was put in drydock at the Erie Basin in Brooklyn. Examination of the outside of the shell and bottom showed no cracks nor any sign of rusting from lightly imbedded steel. There was some slight marine growth, but in general the hull was remarkably clean. The holds were quite dry. The ship encountered very heavy weather throughout the voyage, but behaved well.

Business Items

The American Machinery Syndicate has moved its offices to larger quarters in the Commercial Engineering Building, 35-37 West 39th St., New York.

The Diamant Tool and Manufacturing Co., Inc., formerly located at 164 Emmett St., Newark, N. J., has moved to its new building at 91 Runyson St., Newark, N. J.

The Hess Steel Corporation of Baltimore, Md., has established a branch office at 517 Widener Building, Philadelphia, Penn. Charles O. Rowe, district representative, will be in charge.

The John A. Stewart Electric Co., John A. Stewart, president, formerly of Cincinnati, Ohio, has opened offices in Chicago, room 1034, 208 South La Salle St. The company will handle second-hand electrical and steam machinery.

The Shepard Electric Crane and Hoist Co., Montour Falls, N. Y., has opened an office in the new Lexington Building, Baltimore, Md., in order to take care of Southern business. This office will be in charge of Norman P. Farrar, who for a number of years has been district manager of the Philadelphia territory.

Personals

L. C. SPRAGUE has been appointed assistant secretary of the Chicago Pneumatic Tool Co., with headquarters at 52 Vanderbilt Ave., New York.

J. W. POWELSON, for years production engineer of the Rochester Motors Co., Inc., Rochester, N. Y., is now with the Pittsburgh Model Engine Co. as works manager of the Pittsburgh plant.

J. D. APGAR, formerly with Vandyck Churchill Co., of the New York territory, is now associated with the Machine Tool Engineering Co., 149 Broadway, New York.

(Continued on page 1106)

New Engineering Bureau

Employment Department Established and Recommendations Presented to President on Reconstruction

At a meeting of the Engineering Council called on Nov. 21 to determine the approximate limitations of its field of activity and to consider a working program it was decided that an Engineering Societies' Employment Bureau should be established at once, principally to meet the new need which had arisen for an agency to aid engineers who have been in military service to find suitable positions.

The four secretaries of the Founder Societies of the United Engineering Society were appointed a board of managers, and Walter V. Brown was made secretary in immediate charge. This action was taken as the result of the joint meeting held the previous day by the present secretaries and the American Engineering Service. The resolutions further provided that the American Engineering Service be instructed to turn over its office equipment and records and to instruct its operating staff to report for further service to said bureau when organized, and that thereupon the American Engineering Service be automatically discharged. It was determined that the work should be started on the basis of no charge, with headquarters in the Engineering Societies Building, 29 West 39th St., New York.

The work of the American Engineering Service was cited as having been of inestimable value to the Government through the coöperation between the four Founder societies and the Government, and a resolution was passed expressing high appreciation of the accomplishments of George J. Foran and his associates during his chairmanship.

As defining its field of activity the following resolution was passed: "The Engineering Council understands its field of activity to be approximately as follows: (1) Council may deal with any matter of general interest for which joint action of two or more of its member societies would have been appropriate if council had not been established. (2) Council may initiate and carry through projects of the general character defined in the by-laws, for which the necessary financial provision has been made, but council shall not undertake expenditures in excess of appropriations for its uses made by the United Engineering Society on behalf of the Founder societies and the contributions from other member societies unless specific provision shall have been made therefor by sub-

scription, donation or otherwise; moneys received by Engineering Council shall be turned into the treasury of the United Engineering Society and disbursed by it for the purposes designated. (3) Council may take up and in its discretion act upon any matter of general interest referred to it by any member society or by any other society, national, state or local, or any branch of Government, or by any individual or group of individuals."

It was further resolved "that Engineering Council will as a rule avoid considering any matter specifically within the province of only one member society and not of the others."

A letter was addressed to President Wilson on Nov. 15 by J. Parke Channing, in which he said in part:

"I am advised that you have under consideration the appointment of a reconstruction commission to develop a comprehensive program for the nation's conversion from a war to a peace basis. As chairman of Engineering Council I respectfully ask that you consider the appointment of at least one engineer on this commission, basing my recommendation upon the fact that all construction and practically all manufacturing is under the management of engineers."

The following reply was received from the White House, under date of Nov. 20:

"My dear Mr. Channing: I have your letter of Nov. 15, which Mr. Rickard has been kind enough to hand me. You may rest assured that I realize what a service engineers can render in reconstruction problems from time to time. We are handling reconstruction questions just now by a process of consultation between existing instrumentalities, which I hope will prove useful and effective. Cordially and sincerely yours, WOODROW WILSON."

It was voted to abolish the War Committee of Technical Societies, and the chairman and members of the committee were thanked for their patriotic service.

* * *

War Losses to American Shipping

From the beginning of the European war on Aug. 3, 1914, to the signing of the armistice on Nov. 11, 1918, the authenticated loss of the American merchant marine from acts of the enemy was 775 lives and 145 vessels of 354,449 gross tons, these figures being taken from the official records of the Bureau of Navigation, Department of Commerce.

These figures do not include the vessels lost by the Navy or by the Army and the lives that were sacrificed thereby, nor do they include merchant vessels in which it is not yet established the loss was due to acts of the enemy.

The killing at sea of 703 persons on American merchant ships is charged to submarine torpedoes; 38 were killed by gunfire and 34 by drifting enemy mines.

Thanksgiving Feast in the Air

Nine officers of the Aero Club of America and the Standard Aircraft Corporation ascended 2800 ft. in a Handley-Paige airplane on Thanksgiving Day, and for 22 minutes enjoyed a midair feast of roast turkey and trimmings.

The flight was made from the new landing field of the Aerial Mail Service in Elizabeth, N. J., and the machine used is the one that will enter the Government service when the New York-Chicago air mail system is inaugurated Dec. 15. The feat was done to commemorate the starting of the new air mail route.

(Continued from page 1105)

JOSEPH R. HAGUE, formerly with the Independent Pneumatic Tool Co., has joined the selling force of W. K. Stamets, machine-tool dealer, Pittsburgh, Penn.

E. D. SPICER has resigned as factory manager and treasurer of the Moore Steam Turbine Corporation, Wellsville, N. Y., effective Jan. 1. He has been with the corporation since its formation.

FRANK J. KILLCOYNE, formerly assistant of the tool department of the Remington Arms Co., Bridgeport, Conn., has been appointed assistant superintendent of the Lincoln Machine Co., Pawtucket, R. I.

L. E. SCHUMACHER, for the past eight years chief inspector of the Westinghouse Electric and Manufacturing Co. at East Pittsburgh, Penn., has become works manager of the Krantz Manufacturing Co., Brooklyn, N. Y., the latest subsidiary of the Westinghouse company.

RICHARD A. WATSON, secretary and production manager of the American Bronze Corporation, Berwyn, Penn., has resigned from active duty with the corporation, but will continue as a member of the board of directors. Mr. Watson resigned to carry on experimental work on several patents in which he is interested.

A. KOTTSIEPER has recently joined the traveling force of the Walter A. Zelnicker Supply Co. and will look after its interest in the Southwest. For many years Mr. Kottsiepper traveled for the St. Louis Screw Co., prior to which time he was connected with the E. H. Lindley Supply Co., and the Western Iron and Supply Company.

Obituary

JOHN H. LORIMER died at his home in Germantown, Philadelphia, on Nov. 20, of heart disease. He was 52 years old and was widely known as a manufacturer of textile machinery.

E. C. NOYLES, formerly district manager for the Trucson Steel Co. at Los Angeles, Calif., and more recently with the Emergency Fleet Corporation at Philadelphia, died in the latter city Oct. 23 from influenza. He was 33 years of age and a graduate of the Boston Institute of Technology.

O. E. WALKER, president of the Queen City Forging Co., Cincinnati, Ohio, died in that city, Nov. 12. He had been in the forging business in Cincinnati for more than 60 years. In 1882, in partnership with the late F. W. Dinkelman, he organized the company of which he was the head at the time of his death. He was 80 years old.

Trade Catalogs

The Modern Thread Inspection Equipment. Arthur Knapp Engineering Corporation, Park Ave. at 40th St., New York. Catalog. Pp. 18; 8 x 10 in. This catalog gives a number of illustrations of laboratory equipment for the inspection of screw threads and is very descriptive.

Johansson Combination Gage Blocks. The Swedish Gage Co., Inc., 245 West 55th St., New York. Catalog. Pp. 44; 8½ x 11 in. This catalog illustrates and describes Johansson gaging tools. It is not a textbook on the practical application of these gages, but a general descriptive catalog. Adjustable limit gages, tolerance plug gages and standard cylindrical gages are illustrated and described.

New Publications

The A B C of Aviation.—By Capt. Victor W. Pagé. Two hundred and seventy-four 5½ x 8¼-in. pages; 137 illustrations. Published by the Norman W. Henley Publishing Co., New York. Price, $2.50.

This book has been prepared by Captain Pagé as a result of his experience as aviation instructor of the United States Army Signal Corps. It treats of the principles of operation and repair of the airplane in a nontechnical manner. It covers the wide field of airplane theory, design, construction and maintenance in a manner simple enough for the most nontechnical student as the title suggests. The book is of use to the student rather than the aeromotive engineer or mechanic, and as such is the case the fact that the nomenclature is exceedingly incomplete is of little consequence.

Forthcoming Meetings

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month. Young's Hotel. Donald H. C. Tullock, Jr., secretary. Room 41, 166 Devonshire St., Boston, Mass.

Engineers' Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

New England Foundrymen's Association. Regular meeting, second Wednesday of each month. Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadephia, Penn., Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Providence Engineering Society. Monthly meeting fourth Wednesday of each month. A. E. Thornley, corresponding secretary, P. O. Box 796. Providence, R. I.

Rochester Society of Technical Draftsmen. Monthly meeting, last Thursday. O. L. Angevine, Jr., secretary, 857 Genesee St., Rochester, N. Y.

Superintendents' and Foremen's Club of Cleveland. Monthly meeting, third Saturday. Philip Frankel, secretary, 310 New England Building, Cleveland, Ohio.

Technical League of America. Regular meeting, second Friday of each month. Oscar S. Teale, secretary, 240 Broadway, New York.

Western Society of Engineers, Chicago, Ill. Regular meetings, first, second, third and fourth Mondays of each month, except July and August. Edgar S. Nethercut, secretary, 1735 Monadnock Block, Chicago, Ill.

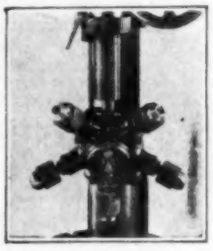
Condensed-Clipping Index of Equipment

Clip, paste on 3 x 5-in. cards and file as desired

Drill Head, "Fortin"

Spafford Tool Works, 10 Hoadley Pl., Hartford, Conn.

"American Machinist," Nov. 28, 1918

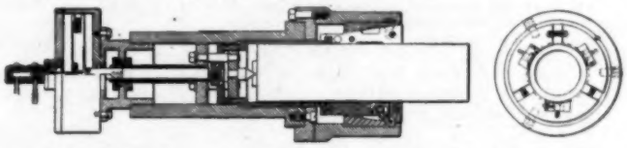


This five-spindle drill head has been brought out on account of the demand for a small-sized turret drill head to be used on large drilling machines, and it is built in two styles and in various sizes. The driving arbor fits into the spindle of the drilling machine, while a separate piece is clamped to the sleeve and an adjustable rod connects the head to this sleeve and prevents it from revolving or from falling out of the spindle. The head is indexed by pressing the lever shown at the front, and the turret may be revolved in either direction while the machine is in motion, all spindles but the one in operation remaining idle.

Chuck, Shell

American Pneumatic Chuck Co., Chicago, Ill., Manufacturers; Neidow & Payson Co., 9 South Clinton St., Selling Agents.

"American Machinist," Nov. 28, 1918

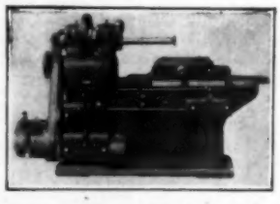


The pull of the draw rod is directly on the jaws, which is claimed to relieve the hinge pin of stresses and insure perfect alignment of the jaws. The grip secured through the long, slow taper bearing on the collet is increased by sliding, hardened tool-steel grip blocks with milled teeth inserted in the front ends of the jaws. Should the air pressure be reduced, or the cut be increased to such a point that the work commences to slip, the grip blocks will slide in the tapered jaw slots, thereby increasing the grip. Perfect alignmnet of the work is also maintained by an additional plain gripping surface in the rear end of the jaws.

Cylinder Grinding Machine, No. 65

Heald Machine Co., Worcester, Mass.

"American Machinist," Dec. 5, 1918

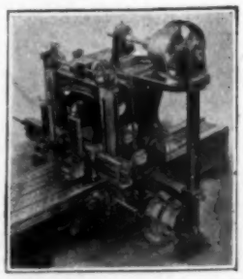


Capacity with spindle regularly furnished, holes 3 in. in diameter or larger by 15 in. long, spindles for other sizes of work being furnished as extras if desired; grinding wheels for regular spindle, 3½ and 4 in. in diameter, 1½-in. face, with shaft hole countersunk 2⅝ in. in diameter by $\frac{5}{16}$ in. deep; speed of standard grinding wheel, 6400 r.p.m.; vertical adjustment, ½ in.; traverse adjustment of cross-slide table, 24 in.; micrometer dial for horizontal adjustment; cross-slide table, 36 in. long, 18 in. wide, with adjustment of 24 in.; finished top of table, 28 in. long, 14 in. wide, with two T-slots; maximum distance from finished pad on cross-slide table to center of grinding circle, 7⅛ in.; floor space, 69 x 112 in.; tight and loose pulleys, 12 x 4½ in.; speed, 950 r.p.m.; net weight, 3850 lb.; motor recommended, 3 hp. with a speed of 1000 to 1200 r.p.m.

Planing-Machine Drive

Bickett Machine and Manufacturing Co., Cincinnati, Ohio

"American Machinist," Dec. 5, 1918

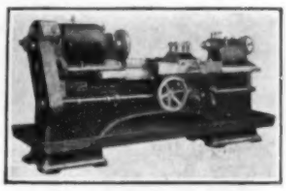


The improvements aim to overcome the vibration set up when the pulleys are mounted on a bracket supported from the housing only and to overcome the troubles caused by making the three-ply endless belt exceptionally tight when first put on, which is apt to cause burned-out bearings and other troubles. Vibration is eliminated by providing the overhead countershaft with an outboard support as shown, this support consisting of a cast-iron pipe column resting on the floor on a supporting base. The difficulty due to tight endless belts is overcome by having the bearings for the countershaft adjustable, both in a horizontal and vertical direction, this adjustment making it possible to so correct the location of the countershaft that the proper belt tension may be secured. The adjustment in a horizontal and vertical direction makes it possible to use a gear drive between the countershaft and the motor.

Lathe, Munition, "Fulton Type B"

Dale Brewster Machinery Co., Inc., 541 West Washington Blvd., Chicago, Ill.

"American Machinist," Nov. 28, 1918



Swing over bed, 20½ in.; swing over tool slide, 9½ in.; distance between centers with 8-ft. bed, 38 in.; length of bed, 8 or 10 ft., as desired; width of bed, 20 in.; depth of bed at thinnest point, 17½ in.; width of ways, center to center, 17¾ in.; height from floor to spindle, 42 in.; front spindle bearing, 4½ x 8 in.; rear spindle bearing, 3 x 6 in.; spindle nose, 3½ in. in diameter, 4 in. long, threaded, four pitch; diameter tailstock spindle, 3½ in.; taper in spindle and tailstock, No. 5 Morse; spindle gear, 13⅝ in. P. D., three pitch, 2¾-in. face; drive pulley, 18 in. diameter, 6½-in. face; length of carriage on ways, 31 in.; width of bridge, 11 in.; feeds per revolution of spindle, ⅛ in., or less to order; approximate weight, 6300 lb.

Angle Plate

Kar Engineering Co., 79 East 130th St., New York City

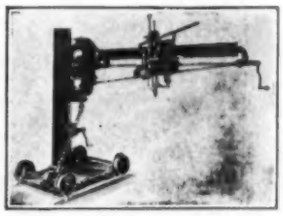
"American Machinist," Nov. 28, 1918

Consists of a movable plate swiveled on a stationary base, the movement permitted being through a full quadrant. The motion of the plate is controlled by the telescopic adjusting screw. Measurements are taken over either of the two pins or buttons and the underside of the overhanging plate located just below the main pivot. Two pins are provided so that the sines on both the angle and its complement can be used, these readings corresponding to the values of sine and cosine given in any table of trigonometric functions. Working surface, 5½ x 5 in. with T-slots for clamping work; height with table horizontal, 5 in.; swing of plate, 90 deg.; micrometer used, 2 in.

Screw-Driving Machine, Traveling, Radial, No. 5

Reynolds Machine Co., Massilon, Ohio

"American Machinist," Dec. 5, 1918

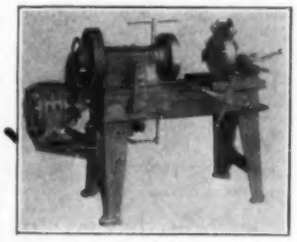


Equipped to handle a range of screws varying from No. 2, ⅜ in. in length, to No. 8, 1 in. long. The spindle-bearing driving mechanism and magazine are mounted on a head which is carried on an I-beam, this being attached to a bracket that turns on pivot bearings in a saddle mounted on a column and adjustable for height within any convenient working range. Power is provided by a motor placed on the pivot bracket and coupled direct to a splined shaft carried under the beam. The carriage or base has wheel axles mounted in ball bearings and is moved along the track by means of a crank. Will cover a width of 36 in. with angles of 30 deg., or a width of nearly 4 ft. at right angles to the motion of the column.

Pipe Machine, No. 1½A

Williams Tool Co., Erie, Penn.

"American Machinist," Dec. 5, 1918



Made for either belt or motor drive and has a capacity of work from ⅛ to 3-in. pipe. The die head has a new type of cut-off which uses a V-rest cut-off set at an angle of 45 deg. similar to the V-type cut-off of a screw machine. It is also provided with a reaming tool for removing the bur. Four speeds are provided, a universal three-jaw chuck being placed at the front end of the spindle and a hand-operated scroll chuck is used at the rear end for steadying the pipe. A belt-driven pump for cutting lubricant is located below the oil sump. Weight, 1800 lb.; floor space with belt drive, 36 in. by 4 ft. 6 in.; size of pulley, 3½ x 12 in.; height to center of chucks, 42 in.

Patented Aug. 20, 1918

WEEKLY PRICE GUIDE OF

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$37.60	$37.60
Northern Basic	34.80	34.80
Southern Ohio No. 2	35.80	35.80
NEW YORK, Tidewater delivery		
Penna. 2X	39.55	39.15
Virginia No. 2	41.70	41.70
Southern No. 2	41.70	41.70
BIRMINGHAM		
No. 2 Foundry	34.00	34.00
PHILADELPHIA		
Eastern Pa. 2X	39.15*	38.85*
Virginia No. 2	40.50†	40.50†
Basic	36.90*	36.60*
Grey Forge	36.90*	36.60*
Bessemer	39.10*	38.80*
CHICAGO		
No. 2 Foundry Local	34.50	34.50
No. 2 Foundry Southern	39.00	39.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	35.40	35.40
Basic	34.40	34.40
Bessemer	36.60	36.60

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.27	$4.245	$4.20	$4.17	$4–4.04	$4.27	$4.20
Soft steel bars	4.17	4.145	4.10	4.17	4–4.04	4.17	4.10
Soft steel bar shapes	4.17	4.145	4.10	4.17	4.14	4.17	4.10
Soft steel bands	4.77	4.995					
Plites, ¼ to 1 in. thick	4.52	4.495	4.45	4.42	4.39	4.25	4.45

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Pittsburgh, mill	$3.50	$4.75
Warehouse, New York	4.75	4.75
Warehouse, Cleveland	4.67	4.95
Warehouse, Chicago	4.10	4.50

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	New York			Cleveland		Chicago	
	Pittsburgh, Mill, in Carloads	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
*No. 28 black	5.00	6.52	6.495	6.445	6.42	6.45	6.52	6.445
*No. 26 black	4.90	6.42	6.395	6.405	6.32	6.35	6.42	6.405
*Nos. 22 and 24 black	4.85	6.37	6.345	6.295	6.27	6.30	6.37	6.295
Nos. 18 and 20 black	4.80	6.32	6.295	6.245	6.22	6.25	6.32	6.245
No. 16 blue annealed	4.45	5.72	5.695	5.645	5.62	5.65	5.72	5.645
No. 14 blue annealed	4.35	5.62	5.595	5.545	5.52	5.55	5.62	5.545
No. 10 blue annealed	4.25	5.52	5.495	5.445	5.42	5.45	5.52	5.445
*No. 28 galvanized	6.25	7.77	7.745	7.695	7.67	7.70	7.77	7.695
*No. 26 galvanized	5.95	7.47	7.445	7.395	7.37	7.40	7.32	7.395
No. 24 galvanized	5.80	7.32	7.295	7.245	7.22	7.25	7.47	7.245

* For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 5c., all gages.

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring at least 1000 lb. of a size (smaller quantities take the standard extras) the following discounts hold:

	Current	One Year Ago
New York	List plus 13%	List plus 25%
Cleveland	List plus 11%	List
Chicago	List plus 13%	List plus 10%

DRILL ROD—Discounts from list price are as follows at the places named:

	Extra	Standard
New York	35%	40%
Cleveland	35%	40%
Chicago	35%	40%

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$15.50–19	$14.00
Cleveland	20.00	15.00
Chicago	19.00	13.50

In coils an advance of 50c. usually is charged.
Note—Stock very scarce generally.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire*		Cast-Iron Welding Rods	
1/4, 11, 5/32, 3/16, 7/32, 1/4, 9/32, 5/16, No. 8, 3/8 and No. 10	22.10 to 33.00	1/8 by 12 in. long	16.00
7/16, No. 12		1/8 by 19 in. long	14.00
1/2, No. 14 and 9/16		3/16 by 19 in. long	12.00
5/8, No. 18		1/4 by 21 in. long	12.00
11/16, No. 20		* Special Welding Wire	
		1/4	33.00
		5/16	30.00
		3/8	38.00

* Very scarce.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	8.00	8.00	7.50
Spring steel (light)	10.00	11.25	11.75
Coppered bessemer rods	9.00	8.00	7.07
Hoop steel	4.77	4.75	4.77
Cold-rolled strip steel	8.02	8.25	8.57
Floor plates	6.27	6.00	6.25

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Steel			Iron		
Inches	Black	Galvanized	Inches	Black	Galvanized
⅛, ¼, and ⅜	44%	17½%	⅛ to 1¼	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

LAP WELD

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD. EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	40%	22½%	½ to 1¼	33%	18%
½	45%	32½%			
¾ to 1¼	49%	36½%			

LAP WELD. EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Stock discounts in cities named are as follows:

	New York		Cleveland		Chicago	
	Black	Galvanized	Black	Galvanized	Black	Galvanized
⅛ to 3 in. steel butt welded	40%	28%	41%	26%	41.1%	26.1%
3½ to 3 in. steel lap welded	36%	25%	37%	23%	37.1%	23.1%

Malleable fittings, Class B and C, from New York stock sell at list + 15%. Cast iron, standard sizes, 5% off.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	26.50*	26.00	23.50
Tin in 5-ton lots	70.00	83.00	80.00
Lead	7.05	8.55	6.50
Spelter	8.60	9.50	8.00

* Government price.

ST. LOUIS			
Lead	6.75	8.25	6.38
Spelter	8.25	9.25	7.75

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Copper sheets, base	38.00	38.00	35.00	38.00	35.00	36.00	35.00
Copper wire (carload lots)	35.00	35.00	36.00	35.00	31.00	33.00	33.50
Brass sheets	39.75	39.75	35.75	40.50	34.00	33.50	35.00
Brass pipe	46.00	46.00	38.50	42.50	46.50	44.00	41.00
Solder (half and half) (case lots)	55.00	58.00	40.50	47.00	43.25	56.00	41.00

Note:—Solder very scarce.

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 1c.; polished takes 1c. per sq.ft. extra for 20-in. widths and under; over 20 in., 2c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; 25% to be added to mill prices for extras; 50% to be added to warehouse price for extras:

	Current	One Year Ago
Mill	$37.75	$29.00
New York	34.25	30.00
Cleveland	38.50	34.00
Chicago	29.50	37.00

SHOP MATERIALS AND SUPPLIES

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 15.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	18.75	21.00	18.40	21.50
New York	17.00	20.00	17.50	20.25
Chicago	22.00	21.00	21.50	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots, for spot delivery, duty paid:

	Current	One Year Ago
New York	9.50–10.50	15.00
Chicago	10.00	17.00
Cleveland	12.00	16.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current 1918	One Year Ago	Current 1918	One Year Ago	Chicago
Copper, heavy and crucible	20.50	22.00	19.00	21.00	18.50
Copper, heavy and wire	19.50	21.00	18.00	21.00	18.00
Copper, light and bottoms	17.00	19.00	15.00	20.00	16.50
Lead, heavy	6.50	4.75	6.00	5.50	6.00
Lead, tea	5.00	4.00	4.00	4.50	5.25
Brass, heavy	11.00	15.00	14.00	14.00	18.00
Brass, light	9.00	10.50	13.00	11.00	10.00
No. 1 yellow brass turnings	11.00	16.00	10.00	15.00	10.50
Zinc	5.25	5.75	5.00	5.50	5.25

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, guaranteed over 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.20c.	32.30c.	33½c.

This is the Government price for lots of from 1 to 14 tons.

COPPER BARS from warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York	32.00	40.00
Chicago	38.00	40.00
Cleveland	36.50	37.00

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	70.00	80.00	86.00	75.00	70.00
Commercial	45.00	40.00	21.50	21.00	15.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	$0.80	1.00	$1.25	$1.40	$0.98	$2.00
Hot pressed hexagon	.80	1.00	1.05	1.20	.78	2.00
Cold punched hexagon	2.50*	1.00	.75	List	1.00	1.50
Cold punched square	2.50*	1.00	.75	List	1.00	1.50

* List plus.

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10%	50%
Chicago	50%	45%
Cleveland	50–10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40–10%	40–10%	37%
Larger and longer up to ½ in. by 30 in.	20–5%	20– 5%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York ..... $2.00 Cleveland ..... List Chicago $2.50

For cast-iron washers the base price per 100 lb. is as follows:

New York ..... $6.00 Cleveland ..... $4.25 Chicago $4.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40%	45%	32½%
Larger and longer up to 1 in. by 30 in.	20–5%	20–5%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	List plus 10%	List plus 10%	List plus 10%	List plus 10%
Chicago	List price	List price	List plus 20%	List price
New York	15% from list	List plus 10%	List plus 5%	10-2½% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	40%	45—5%	40%
Tinned	30%	45—5%	40%

Boiler, ½, ⅝, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:

New York...$5.675 Cleveland...$5.15 Chicago...$5.67 Pittsburgh...$4.65

Structural, same sizes:

New York...$5.775 Cleveland...$5.25 Chicago...$5.77 Pittsburgh...$4.75

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	52.00	40.00	44.00
Brass	49.00	38.00	41.00

For immediate stock shipment 3c. is usually added. The prices of course vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., the advance is 5c. over base (100-lb. lots); for less than 50 lb. but not less than 25 lb., 10c. should be added to the base price; and for quantities of from 10 to 25 lb. the extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet-metal mouldings if ordered in above quantities. The above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ¼ up to 2 in. inclusive in rounds, and ¾ up to 1½ in. inclusivein square and hexagon—all varying by thirty-seconds up to 1 in. and by sixteenths over 1 in. On all shipments aggregating less than 100 lb. there is usually a boxing charge of $1.50.

TIN PLATES—Warehouse prices per box:

Coke tin plate, 14 x 20:

	Cleveland		Chicago	
	Current	One Yr. Ago	Current	One Yr. Ago
100 lb	$9.17½	$12.00	$10.60	$11.75
I. C. 107 lb	9.42½	12.17½	10.70	11.90

Terne plate, 20 x 28:

Base Weight	Net Weight	Coating				
100 lb.	200	3	18.95	18.95	19.10	17.90
I. C.	214	8	19.25	19.25	19.40	18.25
I. C.	270	8	21.75	21.75	21.40	20.35
I. C.	218	12	21.75	21.75	22.60	19.25
I. C.	221	15	22.50	22.50	22.10	19.50
I. C.	226	30	23.25	23.25	22.60	20.50
I. C.	231	25	24.50	24.50	23.10	21.30
I. C.	236	30	25.75	25.75	23.60	22.25
I. C.	241	35	26.75	26.75	25.10	23.25
I. C.	246	40	28.00	28.00	25.60	24.55

NOTE—New York prices furnished on application to dealers. Price varies according to whether the plates are wanted for work essential to the war or for nonessential work.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	12.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	52.00	58.00
Chicago	48.00	50.00

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$1.75	$1.75	$1.75
Philadelphia	1.75	1.75	1.75
Cleveland	2.62½	2.40	2.35
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.65	$4.30	$4.30
Cleveland	4.25	4.60	4.50
Chicago	4.50	4.00	4.00

COKE—The following are prices per net ton at ovens, Connellsville, and cover the past four weeks:

	Dec. 5	Nov. 27	Nov. 21	Nov. 14	Nov. 7
Prompt furnace	$6.00	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Chicago	450-lb. bbl.	$2.50
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

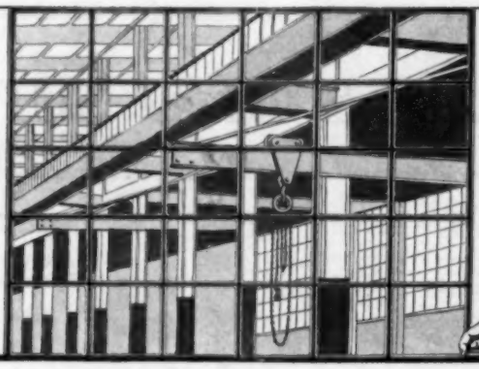
	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels	$1.59	$1.25	$1.90	$1.25	$1.77	$1.22
5-gal. cans	1.84	1.35	2.00	1.40	1.97	1.32

WHITE AND RED LEAD in 500-lb. lots sells as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14.00	14.50	12.25	12.50	14.00	12.50
25 and 50-lb. kegs	14.25	14.75	12.50	12.75	14.25	12.75
12½-lb. keg	14.50	15.00	12.75	13.00	14.50	13.00
5-lb. cans	.....	.....	14.25	14.00	16.00	14.50
1-lb. cans	.....	.....	14.25	14.50	17.00	14.50

NEW *and* ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies



WASHINGTON, D. C.

The Navy aims to give information regarding its purchases to all manufacturers known to be in a position to supply its demand. Owing to the need of prompt action in the cases of all machine tools hereinafter listed, the Navy cannot arrange to permit a postponement of the opening of bids if the manufacturers are able to secure bidding forms and submit their bids prior to date fixed for opening.

In case time does not permit this, it will be appreciated if any manufacturer not receiving information directly regarding these purchases will notify the Purchasing Division, Bureau of Supplies & Accounts, Navy Department, Washington, D. C., in order that the firm's name may be properly listed for all future purchases.

The Bureau of Supplies and Accounts, Navy Department, will soon receive bids furnishing machines and machine tools as follows:

Schedule No. 3544, 125 coopers' punches and miscellaneous cutting punches, delivery Brooklyn, N. Y.

The Bureau of Yards and Docks, Navy Department, will receive bids furnishing machines and machine tools as follows:

Dec. 16—Schedule No. 7328½, centering, key seating machine and 3 double grinders, delivery North Charleston, S. C.

Schedule No. 7338½, 1 engine lathe equipment, delivery Alexandria, Va.

Schedule No. 7366½, 5 automatic grinders, 4 machine grinder equipment, delivery Alexandria, Va.

Dec. 17—Schedule No. 7361½, 8 plate punching tables, delivery Brooklyn, N. Y.

Dec. 20—Schedule No. 7277½, 8 turret lathes with equipment, delivery Alexandria, Va.

Schedule No. 7329½, 11 screw machines, delivery Alexandria, Va.

Schedule No. 7360½, 2 engine lathes, delivery Alexandria, Va.

Schedule No. 7362½, 2 engine lathes, delivery Alexandria, Va.

Schedule No. 7363½, 2 grinding machines, delivery, Alexandria, Va.

Schedule No. 7381½, 1 angle beveling machine, delivery Boston, Mass.

Schedule No. 7383½, 1 motor driven lathe, delivery Brooklyn, N.Y.

Schedule No. 7388½, 2 boring and drilling machines and 1 boring mill, delivery Charleston, S. C.

Schedule No. 7389½, 1 radial drill, 1 radial universal drill, 5 drill presses and 3 sliding head drills, delivery Charleston, S. C.

Schedule No. 7391½, 1 joggling press, delivery Mare Island, (Vallejo P. O.) Calif.

Dec. 23—Schedule No. 7387½, 1 engine lathe, 1 set boring bits, 1 drill press and 1 traverse head shaper.

METAL WORKING

NEW ENGLAND STATES

Conn., New Britain—The North & Judd Manufacturing Co., 500 East Main St., has awarded the contract for the erection of a 1-story, 60 x 140 ft. garage. Noted Nov. 21.

Conn., New Haven—The Mangus Metal Co. is building a 1-story, 16 x 24 ft. foundry addition to its plant.

Me., Portland—The Maine Central R. R., St. John St., is rebuilding its 2-story, 60 x 140 ft. pattern shop. B. T. Wheeler, Ch. Engr.

Mass., Boston—R. De Stafano, 10 Everett St., will build a 1-story, 85 x 100 ft. garage. F. A. Norcross, 46 Cornhill St., Arch.

Mass., Quincy—W. Hall Co., manufacturer of builders' hardware, is building a 1-story, 40 x 50 ft. addition to its factory. Estimated cost, $3500.

Mass., Worcester—The Morgan Construction Co., 15 Belmont St., is altering its machine shop.

R. I., Providence—The L. B. Darling Fertilizer Co., 327 Canal St., will build a 2-story, 64 x 66 ft. machine shop on Smithfield Ave. Estimated cost, $25,000.

R. I., Providence—The Providence Coppersmithing Co., 56 Point St., has awarded the contract for a 2-story, 42 x 65 ft. machine shop to be erected on Eddy St. Estimated cost, $22,000.

R. I., Woonsocket—The Taft-Pierce Manufacturing Co., 32 Mechanics Ave., manufacturer of machinery and tools, is building a 4-story, 125 x 135 ft. addition to its factory.

MIDDLE ATLANTIC STATES

Md., Fairfield—The Union Shipbuilding Co. plans to build an addition to its angle and plate shop and extend its bending and furnace shop.

Md., Mount Washington (Baltimore P. O.)—The Maryland Bolt and Forge Co., Continental Bldg., Baltimore, maufacturer of bolts, nuts, rivets, forgings and kindred specialties, has acquired the plant and property of the Mount Vernon-Woodberry Mills here, and is having plans prepared for altering and equipping same for its own use. R. C. Hoffman, Jr., Pres.

N. J., Cape May—The Bureau of Yards and Docks, Navy Department, Washington, D. C., has awarded the contract for the erection of a blacksmith, coppersmith and electric shop, here. Estimated cost, $8333. Noted Oct. 31.

N. J., Jersey City—J. McWilliams & Son, 372 Sip Ave., manufacturer of hardware specialties, is building a 1 story forge and blacksmith shop. Estimated cost, $9000. Noted Nov. 14.

N. J., Kearny (Arlington P. O.)—Schwarz Bros. Co., 1100 Harrison Ave., has awarded the contract for the erection of a 1-story, 60 x 70 ft. garage. Estimated cost, $10,000. Noted Oct. 17.

N. J., Newark—Fire recently damaged the plant of the American Hame and Bit Co., Hamburg Place and New Jersey R. R. Ave. Loss, $15,000.

N. J., Newark—The Electrical Appliance Manufacturing Co. has acquired a 4-story plant at 820-850 Frelinghuysen Ave., and plans to equip same for the manufacture of electrical specialties.

N. J., Newark—L. Lorentoviez, 74 Union St., has awarded the contract for the erection of a 1-story, 45 x 70 ft. welding shop. Estimated cost, $4000.

N. J., Perth Amboy—The Standard Underground Cable Co., 26 Washington St., plans to build a 1-story, 60 x 130 ft. addition to its copper tube works.

N. Y., Buffalo—The Newman Machinery Sales Co., 607 Erie County Bank Bldg., is in the market for a high speed multiple drill.

N. Y., Buffalo—Fire recently damaged the plant of the Polson Manufacturing Co., 754 Main St., manufacturer of automobile bodies. Loss, $8000. W. F. Polson, Pres.

N. Y., New York (Borough of Manhattan)—The Standard Concrete Steel Co., 105 West 40th St., will build a 1-story, 100 x 225 ft. machine shop on West 61st St. and Amsterdam Ave. Estimated cost, $100,000.

N. Y., New York (Borough of Queens)—The Texas Oil Co., 17 Battery Place, New York City, has awarded the contract for a 1-story, 40 x 200 ft. garage and workshop to be erected on Review Ave., here. Estimated cost, $40,000. Noted Sept. 5.

N. Y., Oswego—The Oswego Tool Co., 136 West 1st St., has had plans prepared by J. H. Seeper, Arch., Arcade Bldg., for the erection of a factory and storage building. Noted Dec. 5.

N. Y., Schenectady—The General Electric Co., River Rd., is building a 35 x 75 ft. addition to its building No. 20. Estimated cost, $35,000.

Penn., East Greenville—The Sanitary Co. of America, Linfield, has awarded the contract for the erection of a 1-story, 75 x 128 ft. addition to its moulding room and factory here. Estimated cost, $8000. E. M. Rhoads, Pres.

Penn., Edgely (Bristol P. O.)—W. Woodhouse, 825 West State St., Trenton, N. J., plans to build a 1-story, 40 x 104 ft. and 40 x 80 ft. chain factory along the Pennsylvania R. R. Estimated cost, $20,000. H. A. Hill, 840 Edgewood Ave., Arch.

Penn., Erie—The Electric Materials Co. plans to build an addition to its plant. Estimated cost, $5000.

Penn., Marietta—The Pennsylvania R. R. has had plans prepared for car repair shops to be erected here, to consist of a 400 x 800 ft. main shop and other buildings including machine shops, forge shop, engine house, etc. A. C. Shand, Broad St. Sta., Philadelphia, Ch. Engr. Noted Sept. 12.

Penn., Nazareth—The Nazareth Foundry and Machine Co. is altering and extending its foundry.

Penn., Philadelphia—The G. & H. Barnett Co., 1076 Frankford Ave., manufacturer of files, has had plans prepared for the erection of a 1-story, 20 x 35 ft. addition to its plant.

Penn., Philadelphia—The J. H. Billington Co., 113 Chestnut St., manufacturer of mill supplies, has awarded the contract for rebuilding its 2-story factory. Estimated cost, $7500. Noted Dec. 5.

Penn., Philadelphia—J. N. Mitchell, 4 South Farragut St., is building a 2-story, 20 x 20 ft. garage. Estimated cost, $25,000.

Penn., Philadelphia—The Philadelphia Steel and Iron Co., Commercial Trust Bldg., has had plans prepared for a 1-story, 40 x 90 ft. shop to be erected on 33rd St. and Gray's Ferry Rd.

Penn., Philadelphia—The Tioga Steel and Iron Co., 52nd St. and Gray's Ave., has purchased 4½ acres of land adjoining its plant and plans to extend its plant.

Penn., Pittsburgh—Fire recently destroyed a portion of the Crescent Works of the Crucible Steel Co. of America, Oliver Bldg. Loss about $75,000.

Penn., Pittsburgh—The Pittsburgh Mining Machinery Co., First National Bank Bldg., has awarded the contract for a 1-story, 65 x 80 ft. shop building to be erected on Cantrell and Magnolia St. Estimated cost, $15,000. Noted Oct. 3.

Penn., Pottsville—Fire recently destroyed the plant of the Cressona Wagon Works including a machine shop, also blacksmith, wheelwright and automobile departments. Loss about $50,000.

SOUTHERN STATES

Ga., Atlanta—Fire recently damaged the machine shop of W. W. McLaughlin, Whitehall St., specializing in automobile repair works.